FIG. 1

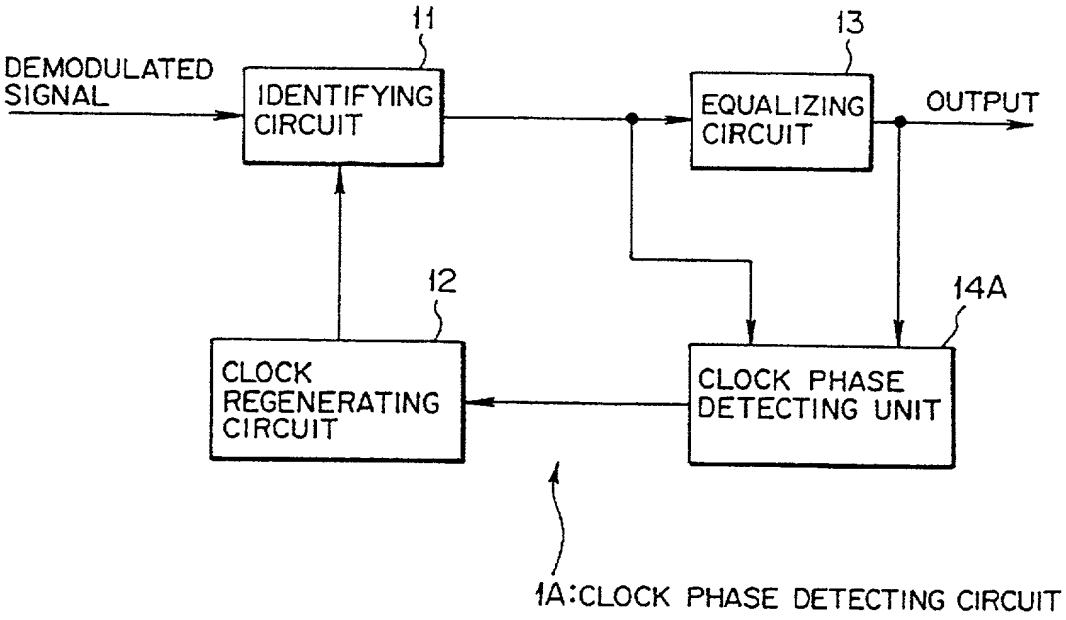

11
13
DEMODULATED SIGNAL
IDENTIFYING CIRCUIT
EQUALIZING CIRCUIT
OUTPUT
12
14A
CLOCK REGENERATING CIRCUIT
CLOCK PHASE DETECTING UNIT
1A:CLOCK PHASE DETECTING CIRCUIT

FIG. 2

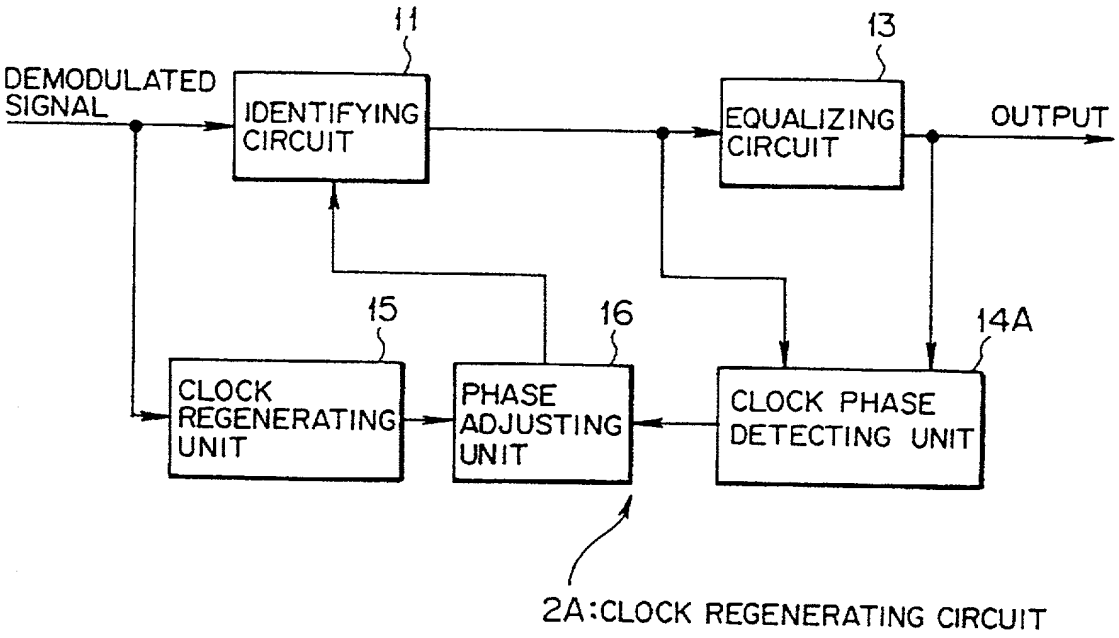
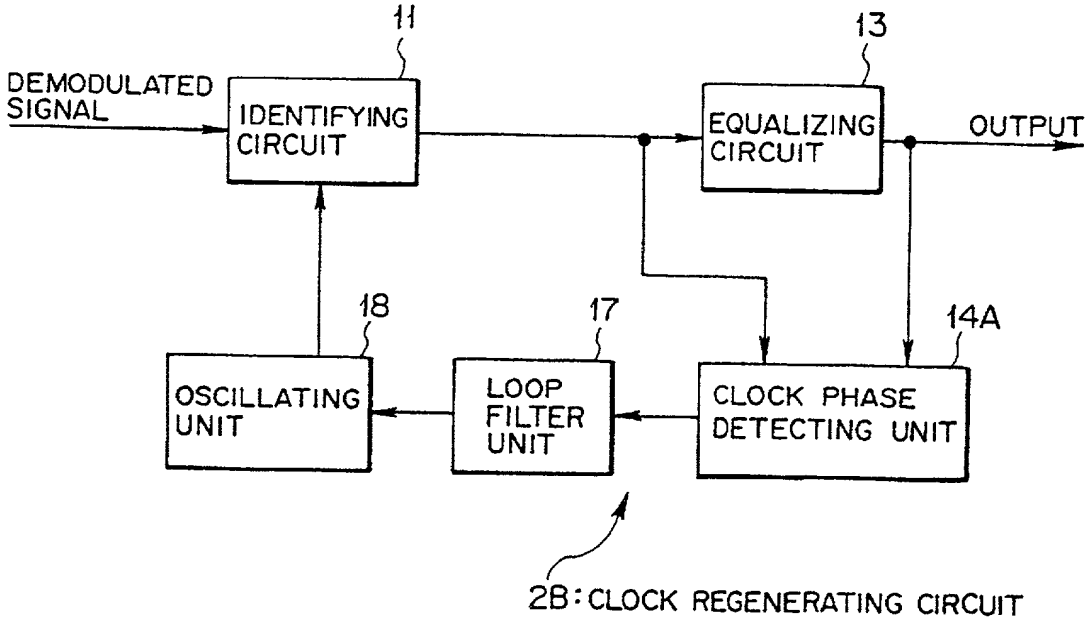

11
13
DEMODULATED SIGNAL
IDENTIFYING CIRCUIT
EQUALIZING CIRCUIT
OUTPUT
15
16
14A
CLOCK REGENERATING UNIT
PHASE ADJUSTING UNIT
CLOCK PHASE DETECTING UNIT
2A:CLOCK REGENERATING CIRCUIT

FIG. 3



Petitioner Apple Inc. - Exhibit 1009, p. 0059

FIG.4

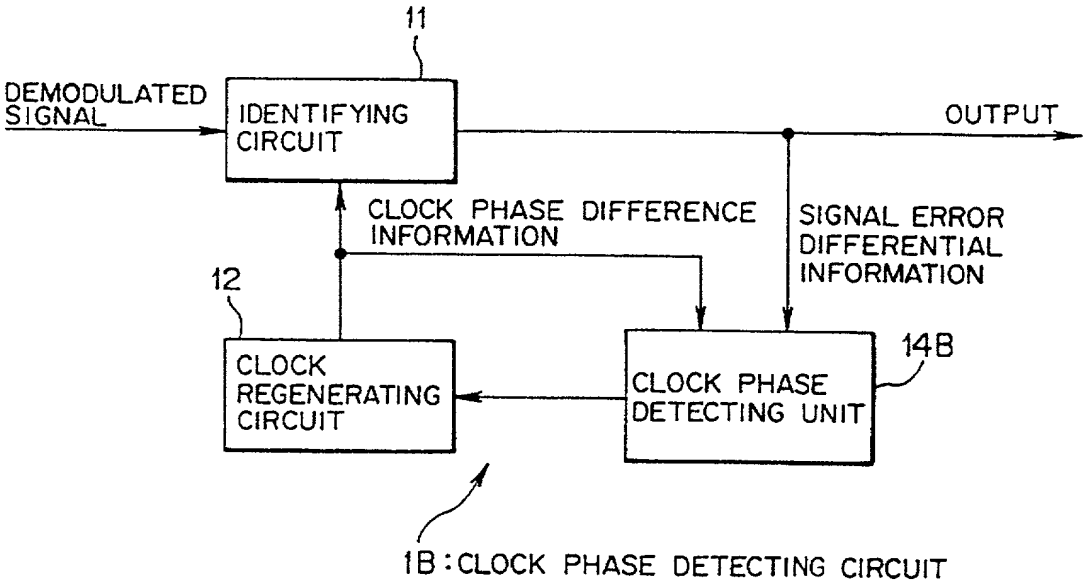

11
DEMODULATED SIGNAL
IDENTIFYING CIRCUIT
OUTPUT
CLOCK PHASE DIFFERENCE INFORMATION
SIGNAL ERROR DIFFERENTIAL INFORMATION
12
CLOCK REGENERATING CIRCUIT
CLOCK PHASE DETECTING UNIT
14B
1B : CLOCK PHASE DETECTING CIRCUIT

FIG.5

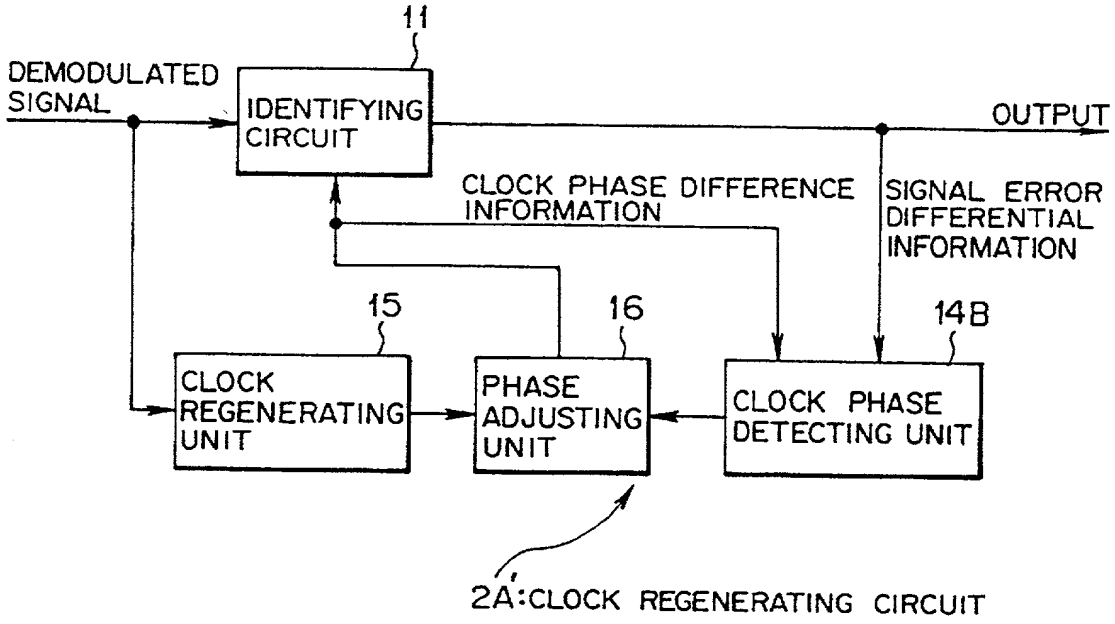

11
DEMODULATED SIGNAL
IDENTIFYING CIRCUIT
OUTPUT
CLOCK PHASE DIFFERENCE INFORMATION
SIGNAL ERROR DIFFERENTIAL INFORMATION
15
16
14B
CLOCK REGENERATING UNIT
PHASE ADJUSTING UNIT
CLOCK PHASE DETECTING UNIT
2A:CLOCK REGENERATING CIRCUIT

FIG.6

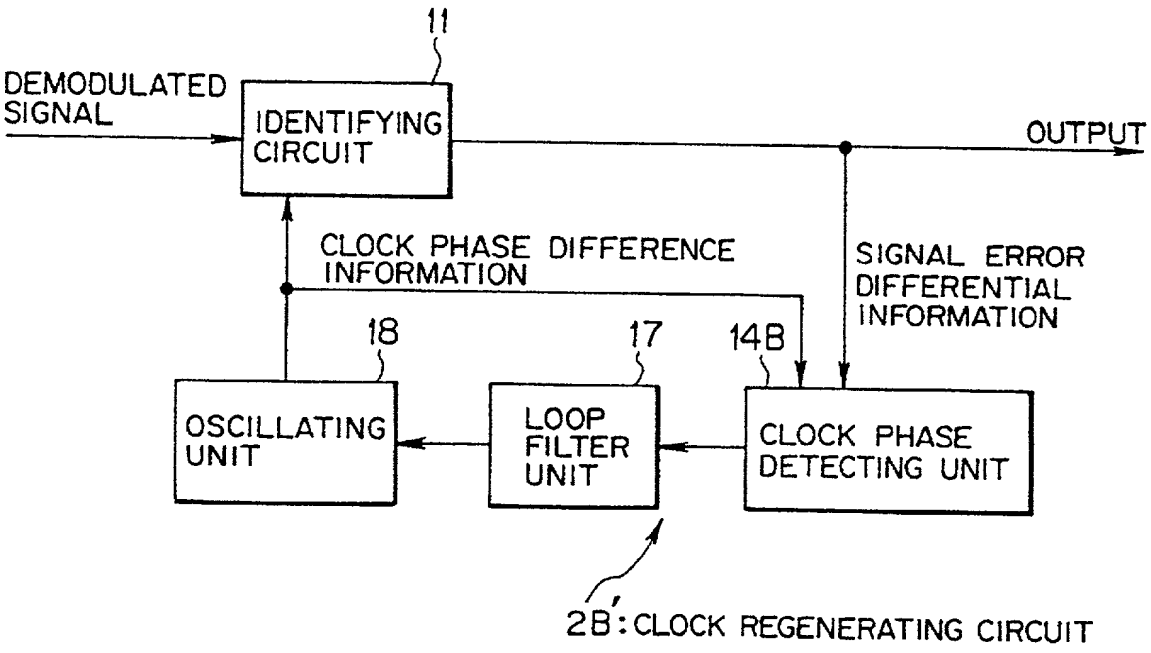

11
DEMODULATED SIGNAL
IDENTIFYING CIRCUIT
OUTPUT
CLOCK PHASE DIFFERENCE INFORMATION
SIGNAL ERROR DIFFERENTIAL INFORMATION
18
17
14B
OSCILLATING UNIT
LOOP FILTER UNIT
CLOCK PHASE DETECTING UNIT
2B': CLOCK REGENERATING CIRCUIT

FIG. 7

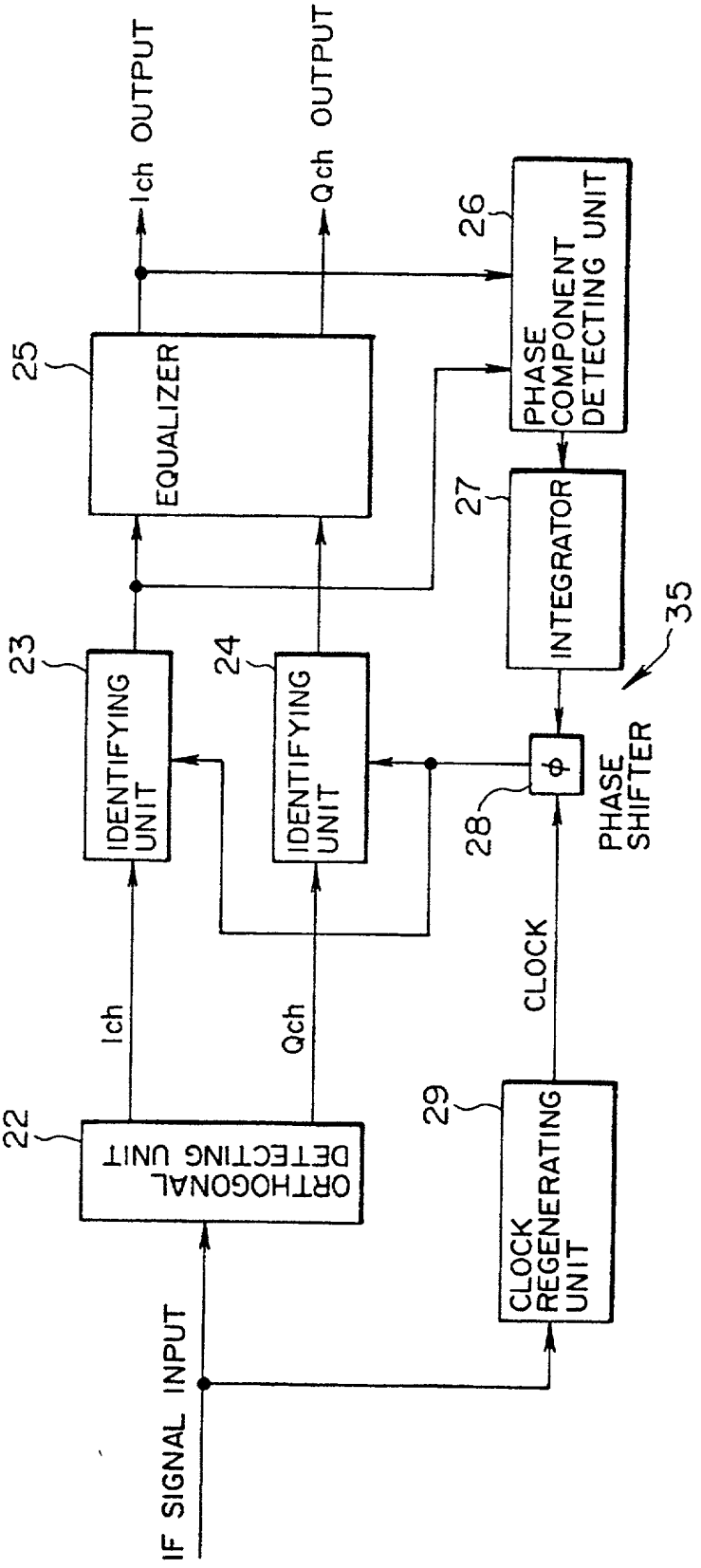

Ich OUTPUT
Qch OUTPUT
26
PHASE COMPONENT DETECTING UNIT
25
EQUALIZER
27
INTEGRATOR
35
23
IDENTIFYING UNIT
24
IDENTIFYING UNIT
φ
28
PHASE SHIFTER
Ich
Qch
CLOCK
22
ORTHOGONAL DETECTING UNIT
29
CLOCK REGENERATING UNIT
IF SIGNAL INPUT

FIG.8

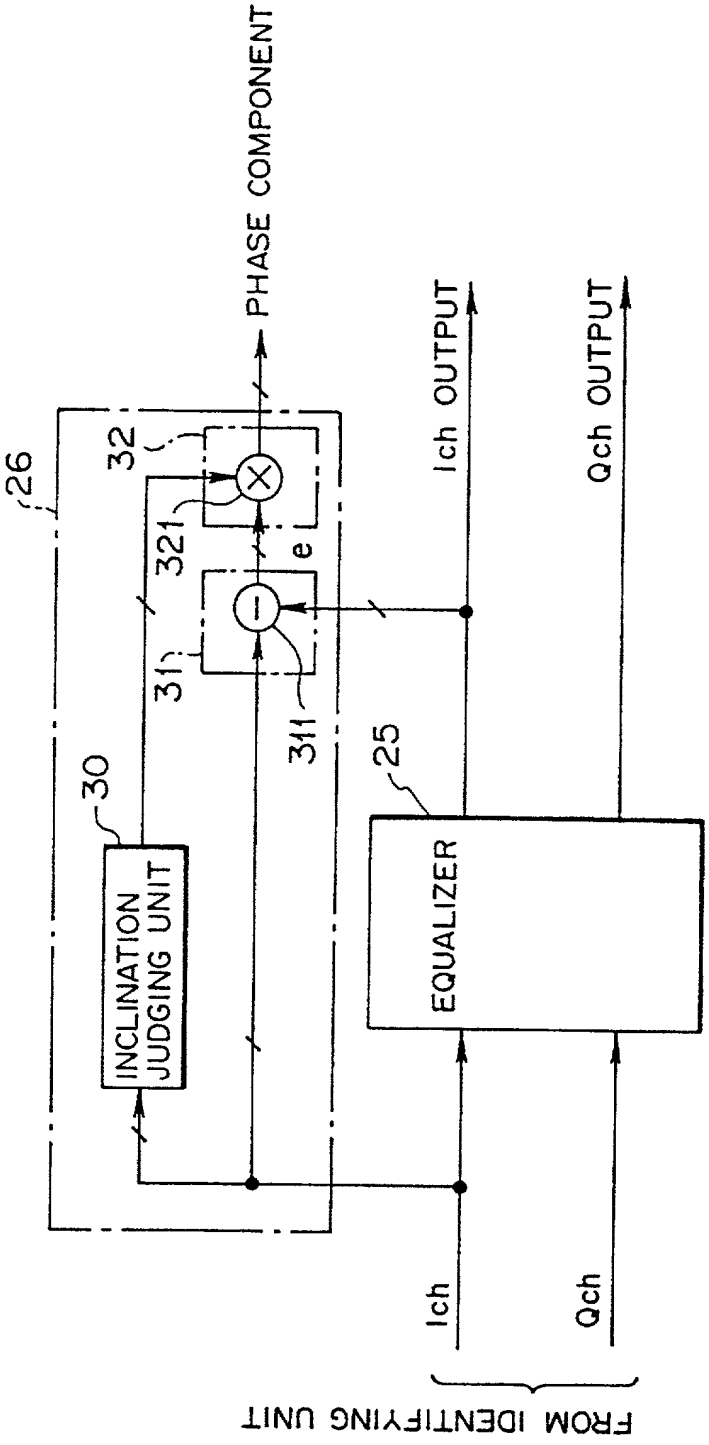

PHASE COMPONENT
Ich OUTPUT
Qch OUTPUT
26
32
321
e
31
311
30
25
INCLINATION JUDGING UNIT
EQUALIZER
Ich
Qch
FROM IDENTIFYING UNIT

FIG. 9

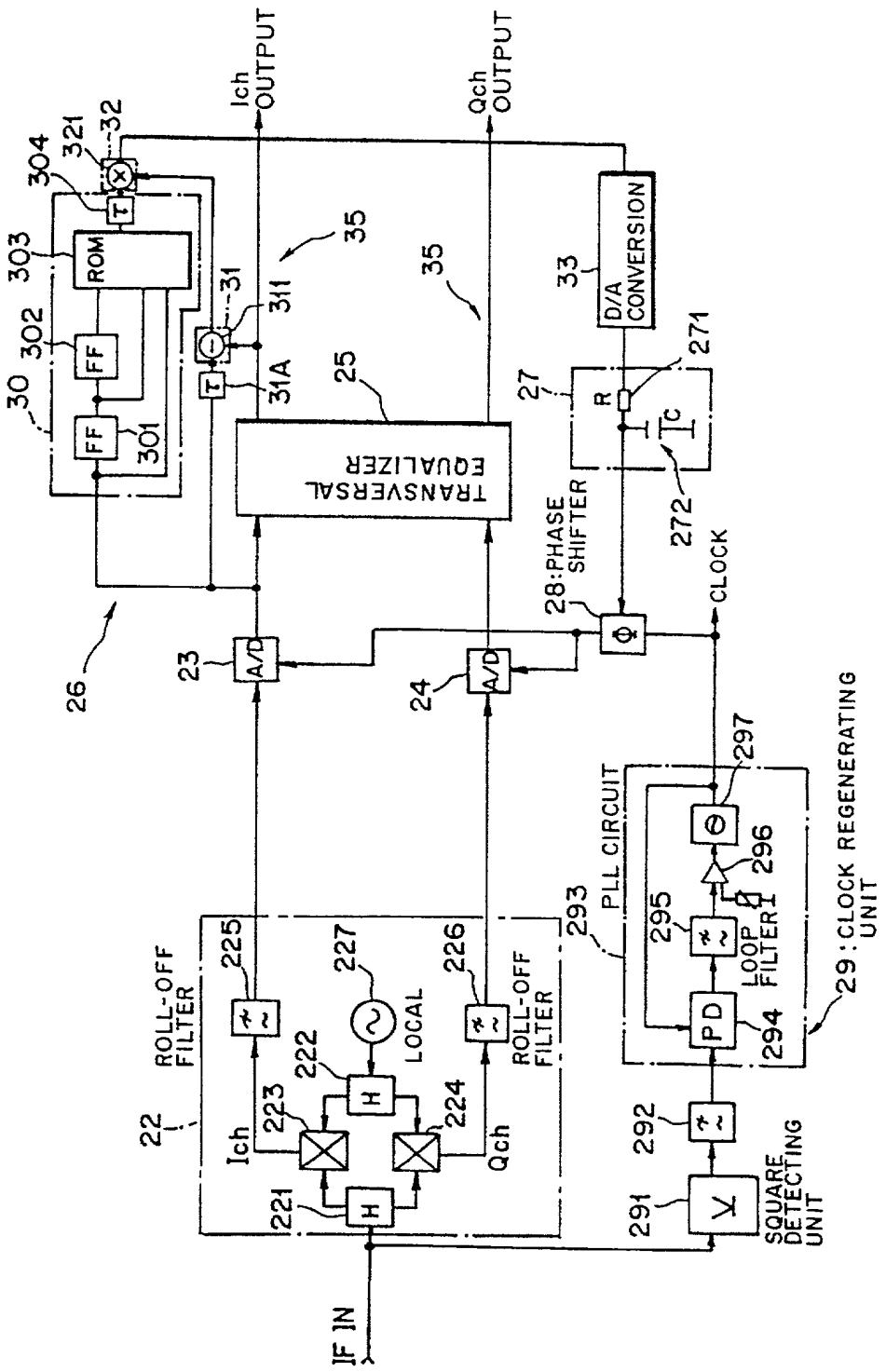

Ich OUTPUT
Qch OUTPUT
D/A CONVERSION
TRANSVERSAL EQUALIZER
ROM
FF
FF
28:PHASE SHIFTER
CLOCK
A/D
A/D
ROLL-OFF FILTER
ROLL-OFF FILTER
LOCAL
PLL CIRCUIT
LOOP FILTER
PD
SQUARE DETECTING UNIT
29:CLOCK REGENERATING UNIT
IF IN
Ich
Qch

FIG. 10

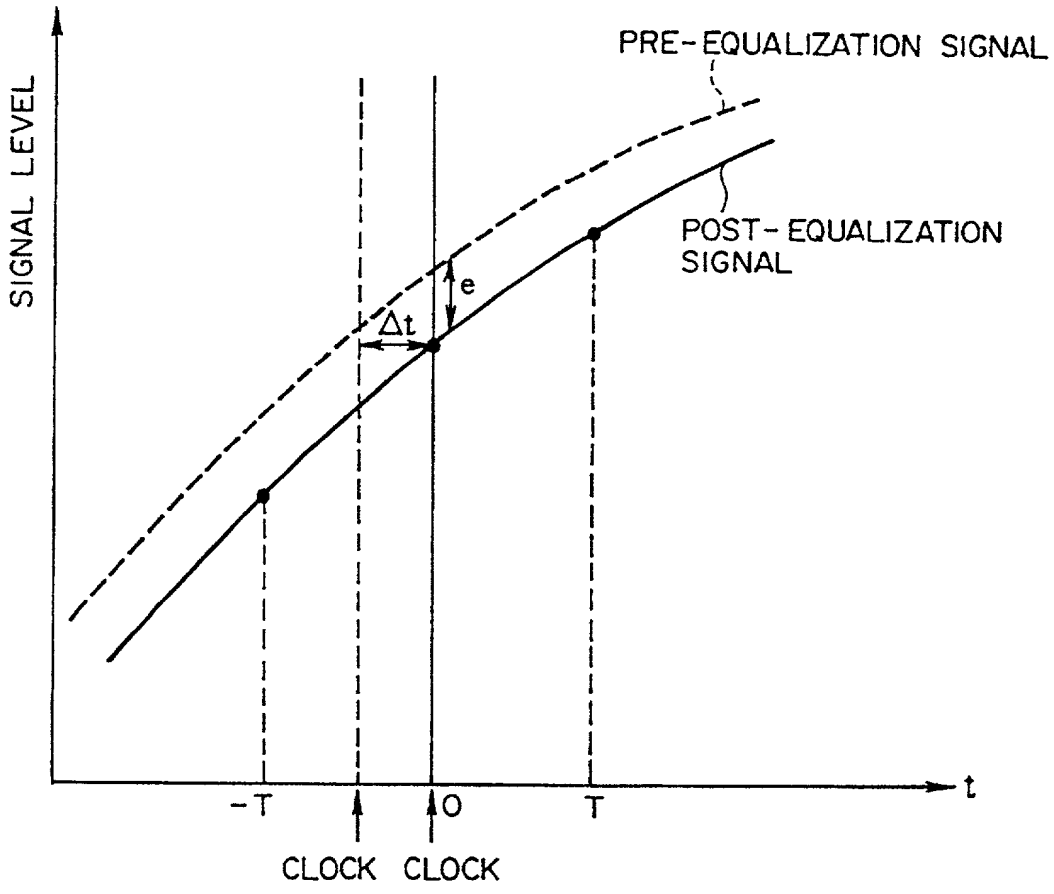

PRE-EQUALIZATION SIGNAL
POST-EQUALIZATION SIGNAL
SIGNAL LEVEL
e
Δt
-T
O
T
t
CLOCK
CLOCK

FIG. 11

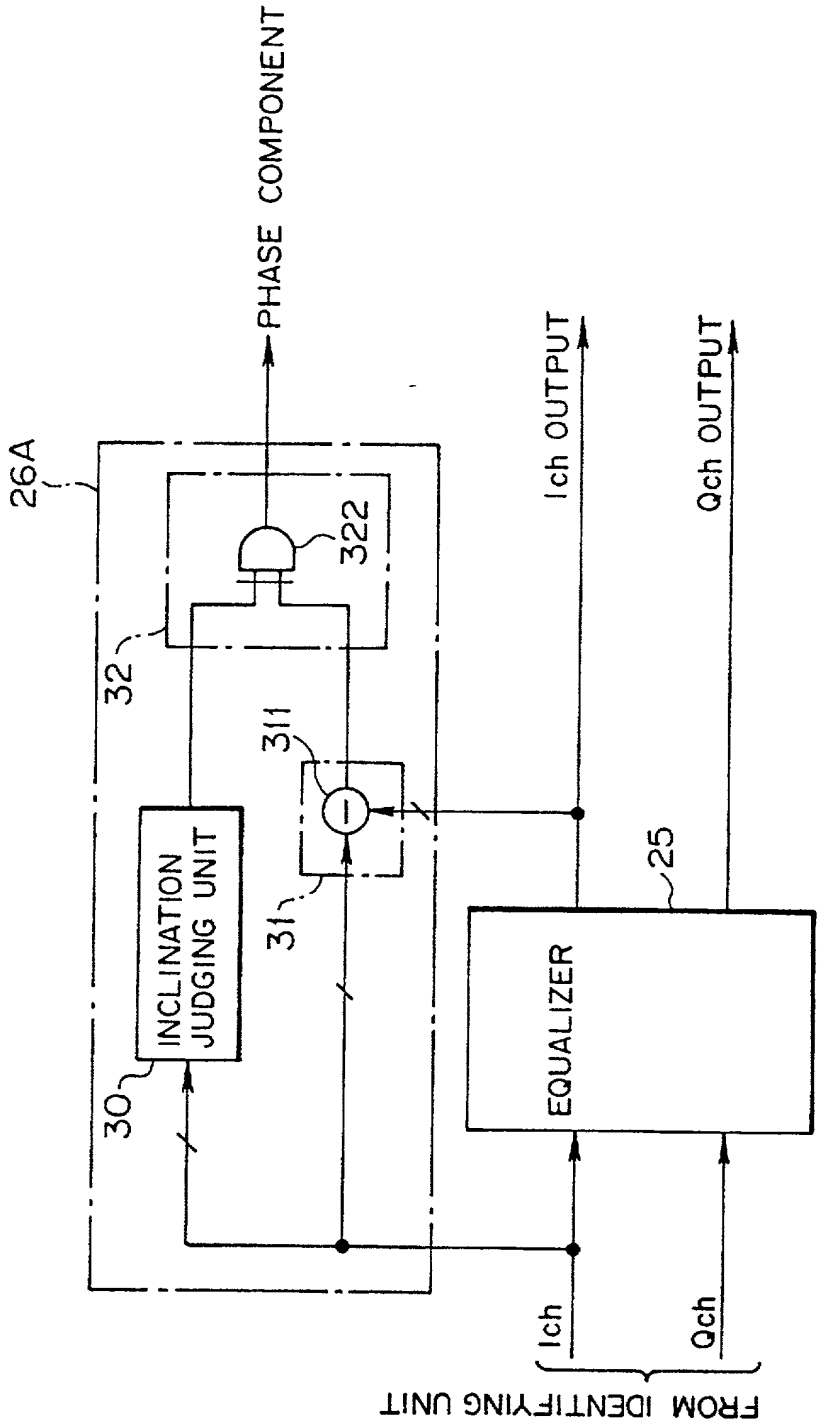

PHASE COMPONENT
Ich OUTPUT
Qch OUTPUT
26A
322
32
311
31
INCLINATION JUDGING UNIT
30
25
EQUALIZER
Ich
Qch
FROM IDENTIFYING UNIT

FIG. 12

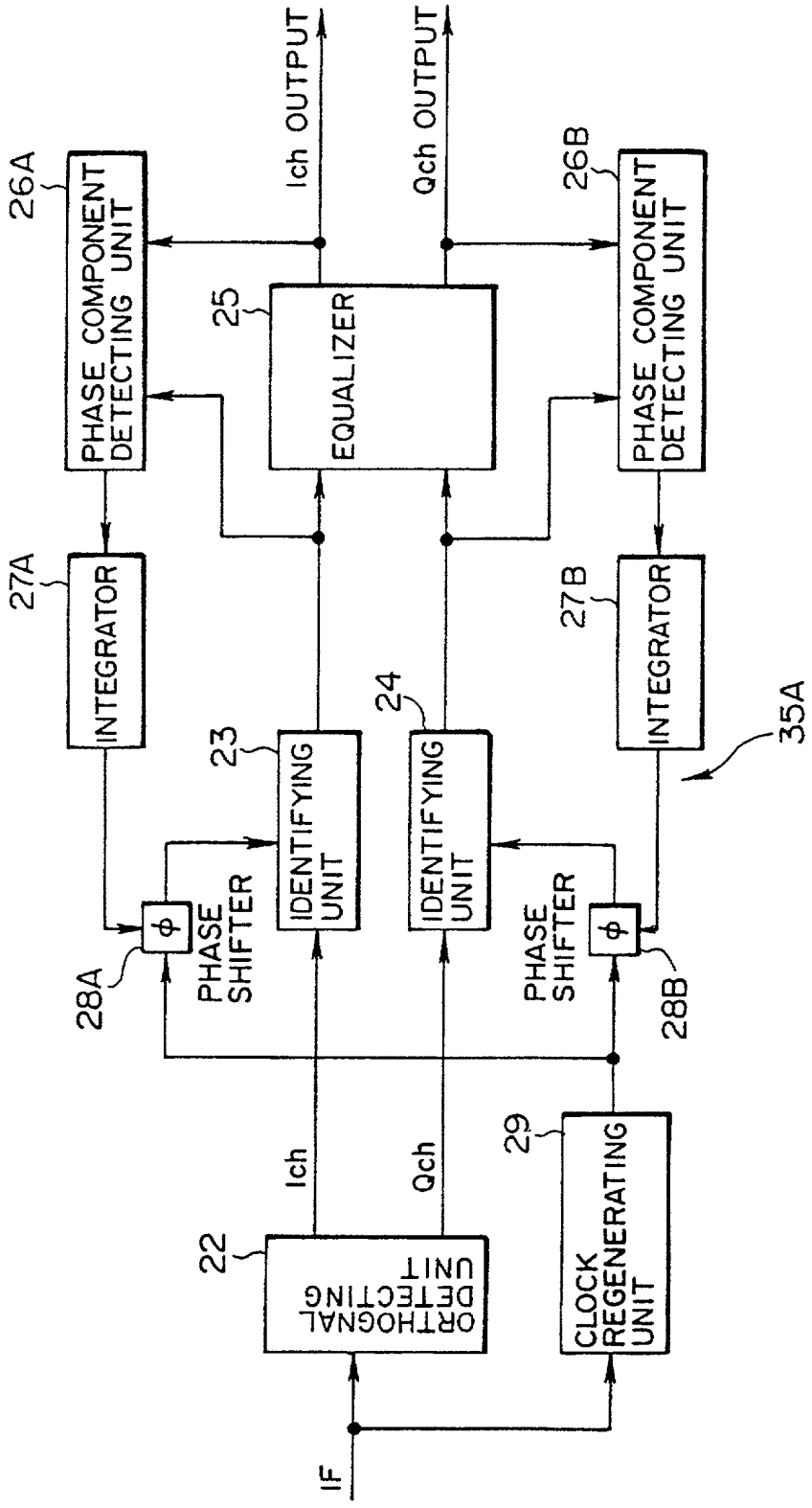

Ich OUTPUT
Qch OUTPUT
26A
PHASE COMPONENT DETECTING UNIT
25
EQUALIZER
26B
PHASE COMPONENT DETECTING UNIT
27A
INTEGRATOR
27B
INTEGRATOR
24
23
IDENTIFYING UNIT
IDENTIFYING UNIT
35A
28A
PHASE SHIFTER
PHASE SHIFTER
28B
Ich
Qch
29
CLOCK REGENERATING UNIT
22
ORTHOGNAL DETECTING UNIT
IF

FIG. 13

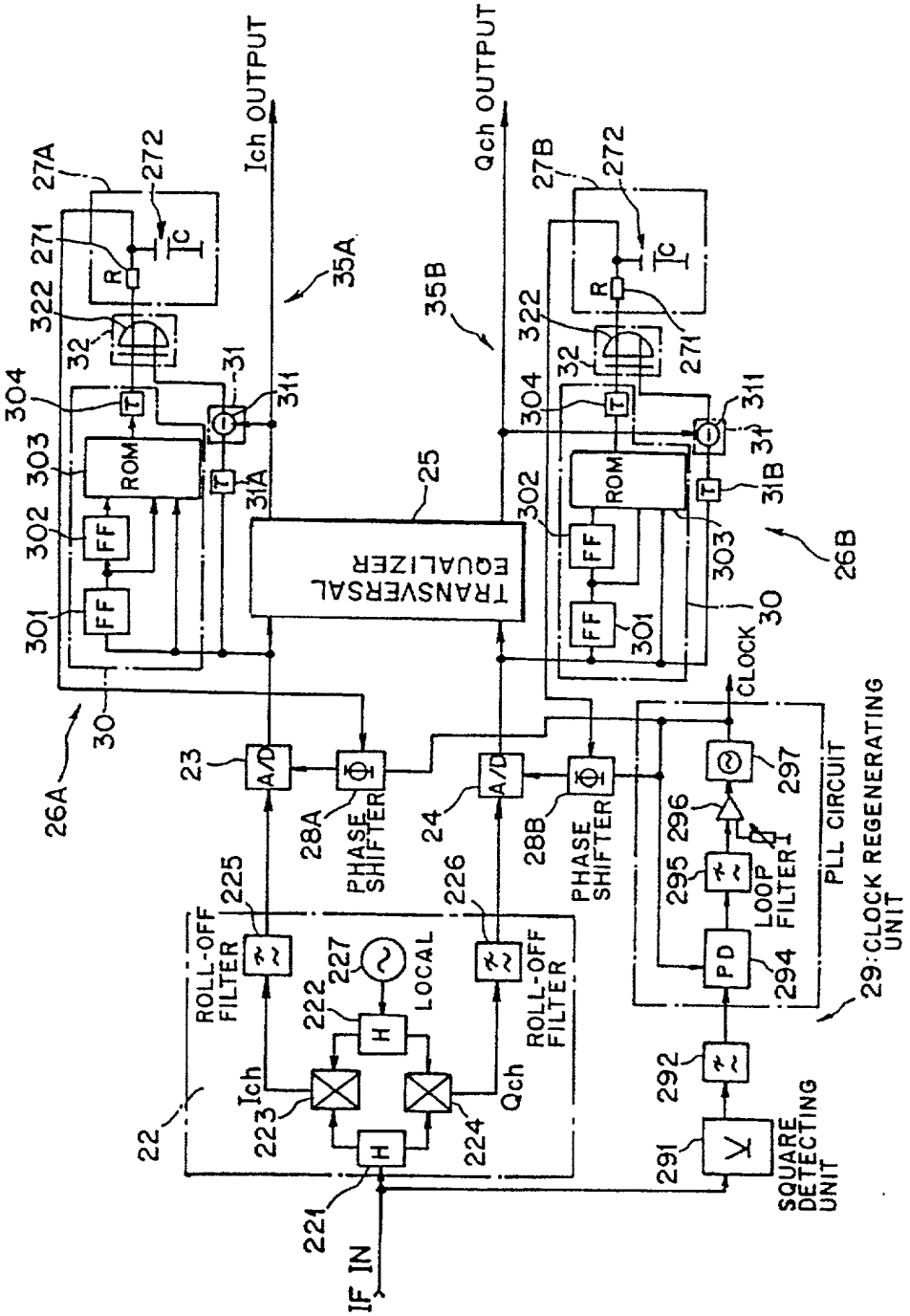

Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
ROM
FF
R
Ic
T
A/D
PHASE SHIFTER
ROLL-OFF FILTER
LOCAL
H
Ich
Qch
IF IN
CLOCK
PD
LOOP FILTER
PLL CIRCUIT
29: CLOCK REGENERATING UNIT
SQUARE DETECTING UNIT

FIG. 14

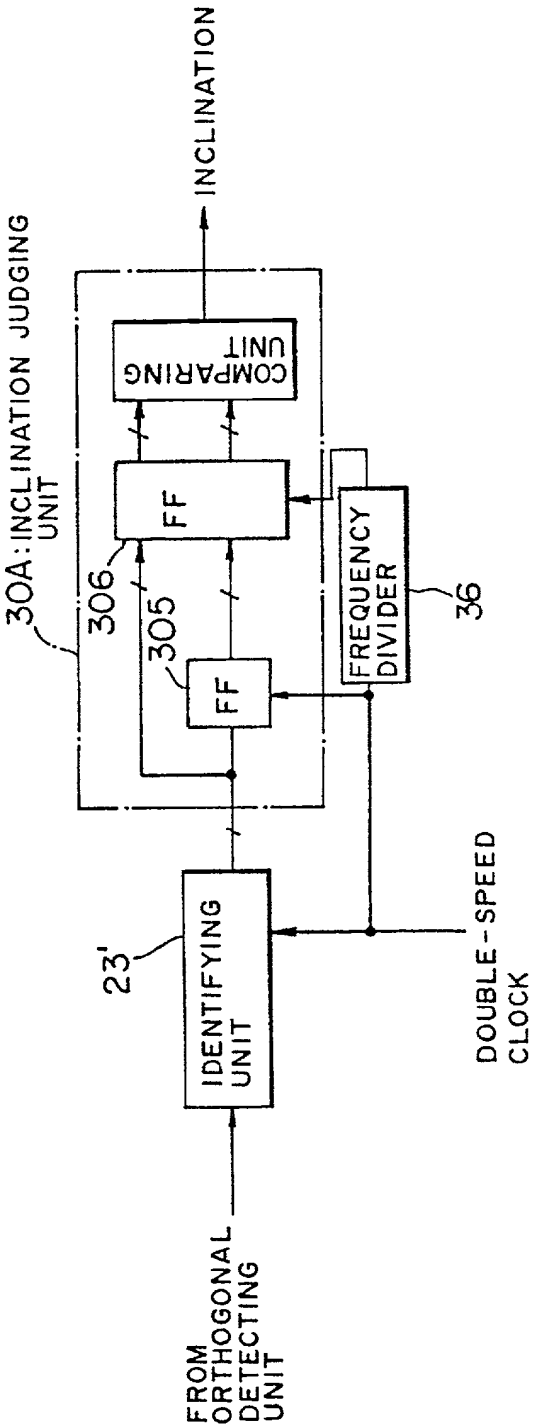

INCLINATION
30A: INCLINATION JUDGING UNIT
COMPARING UNIT
FF
306
305
FF
FREQUENCY DIVIDER
36
23'
IDENTIFYING UNIT
DOUBLE-SPEED CLOCK
FROM ORTHOGONAL DETECTING UNIT

FIG. 15

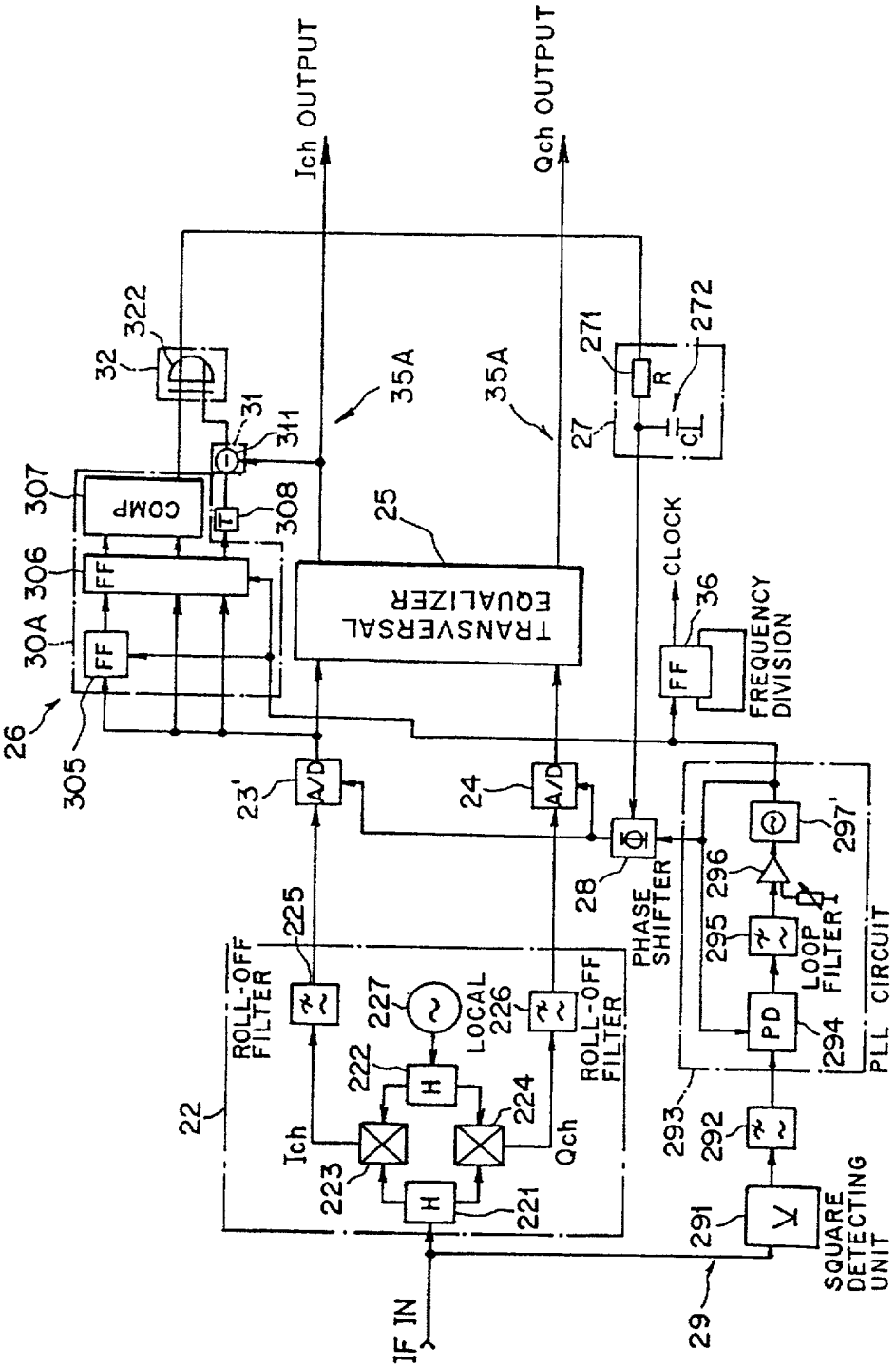

Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
COMP
FF
CLOCK
FREQUENCY DIVISION
A/D
PHASE SHIFTER
ROLL-OFF FILTER
LOCAL
LOOP FILTER
PD
PLL CIRCUIT
SQUARE DETECTING UNIT
IF IN
Ich
Qch
H
R
CL
22
23'
24
25
26
27
28
29
30A
31
32
35A
35A
36
221
222
223
224
225
226
227
271
272
291
292
293
294
295
296
297'
305
306
307
308
311
322

FIG. 16

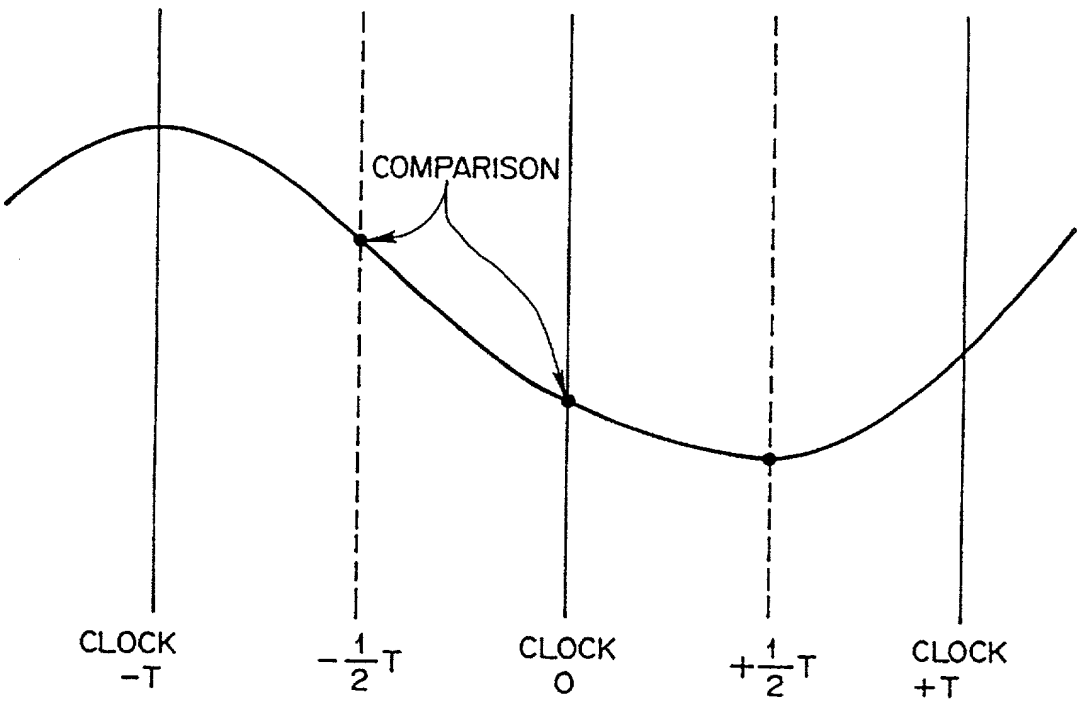


FIG. 17

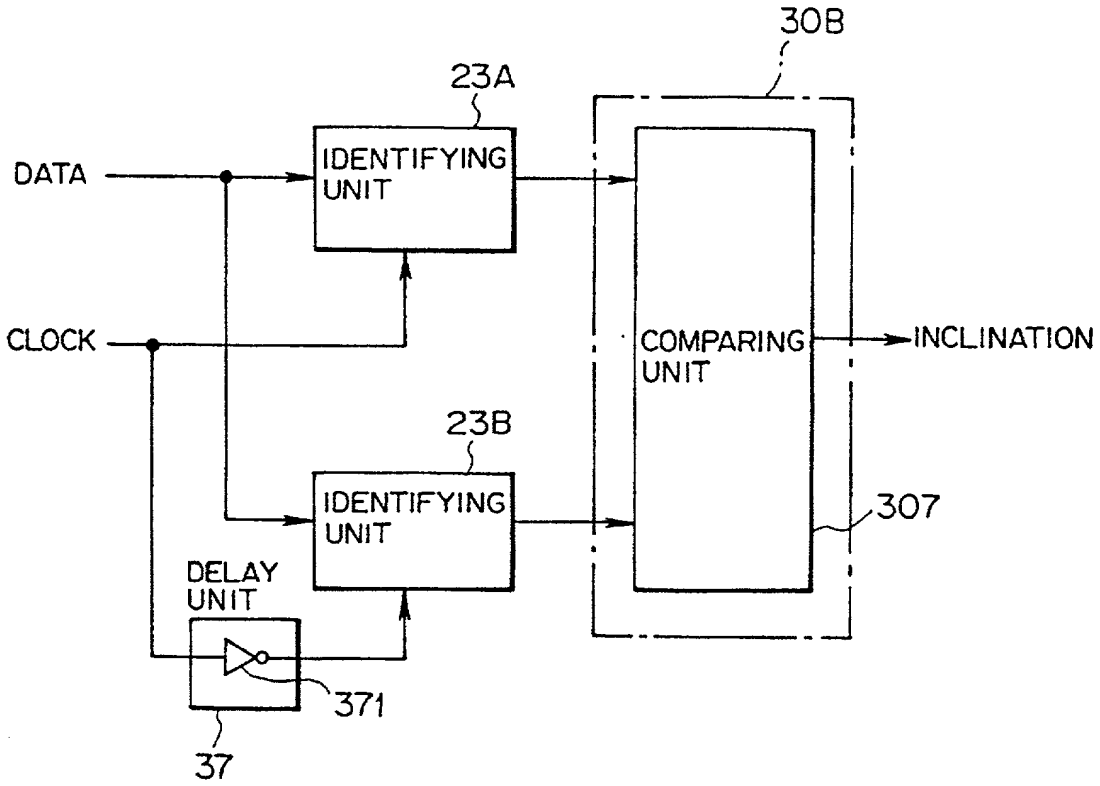
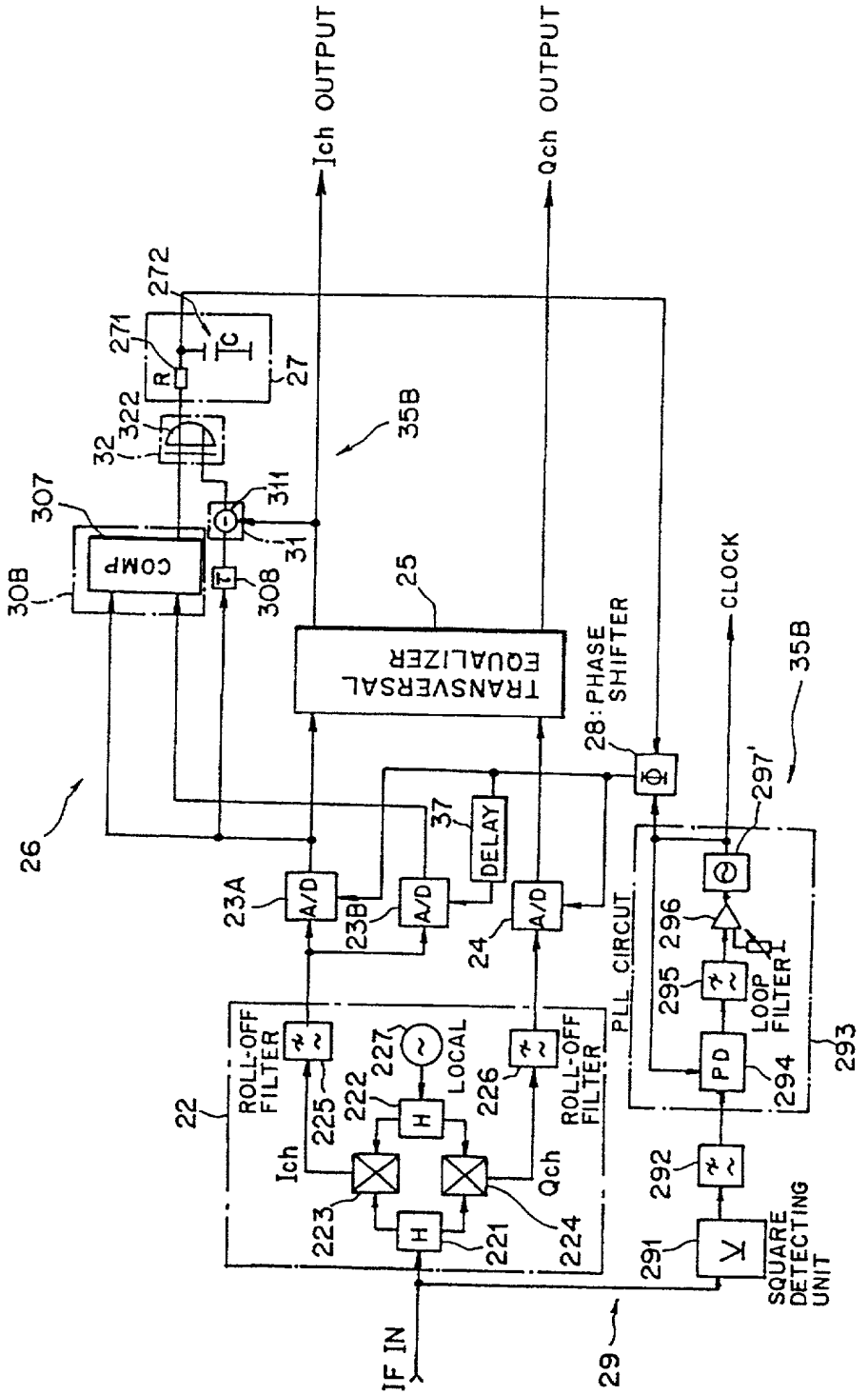

30B
23A
DATA
IDENTIFYING UNIT
CLOCK
COMPARING UNIT
INCLINATION
23B
IDENTIFYING UNIT
307
DELAY UNIT
371
37

FIG. 18


Ich OUTPUT
Qch OUTPUT
CLOCK
IF IN
TRANSVERSAL EQUALIZER
28: PHASE SHIFTER
PLL CIRCUIT
ROLL-OFF FILTER
LOCAL
LOOP FILTER
SQUARE DETECTING UNIT
DELAY
A/D
COMP
PD
Ich
Qch
22
23A
23B
24
25
26
27
271
272
291
292
293
294
295
296
297'
29
30B
307
308
31
311
32
322
35B
37
221
222
223
224
225
226
227

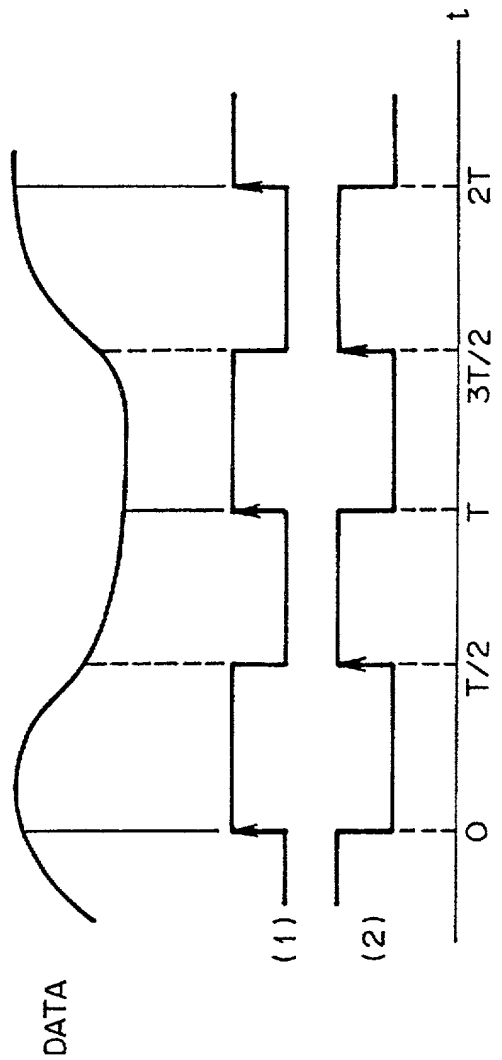


FIG. 19(a)

FIG. 19(b)

FIG. 19(c)

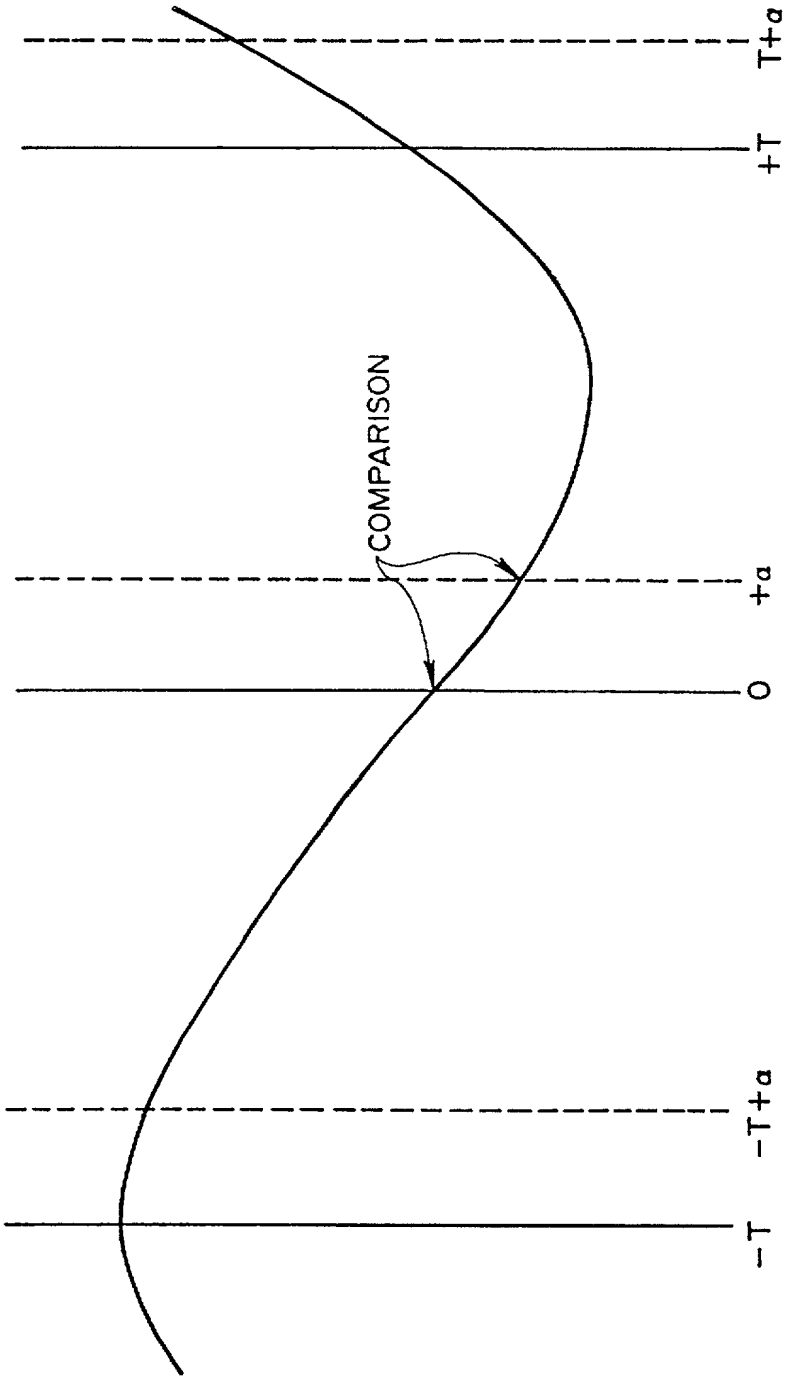


FIG. 20

FIG.21

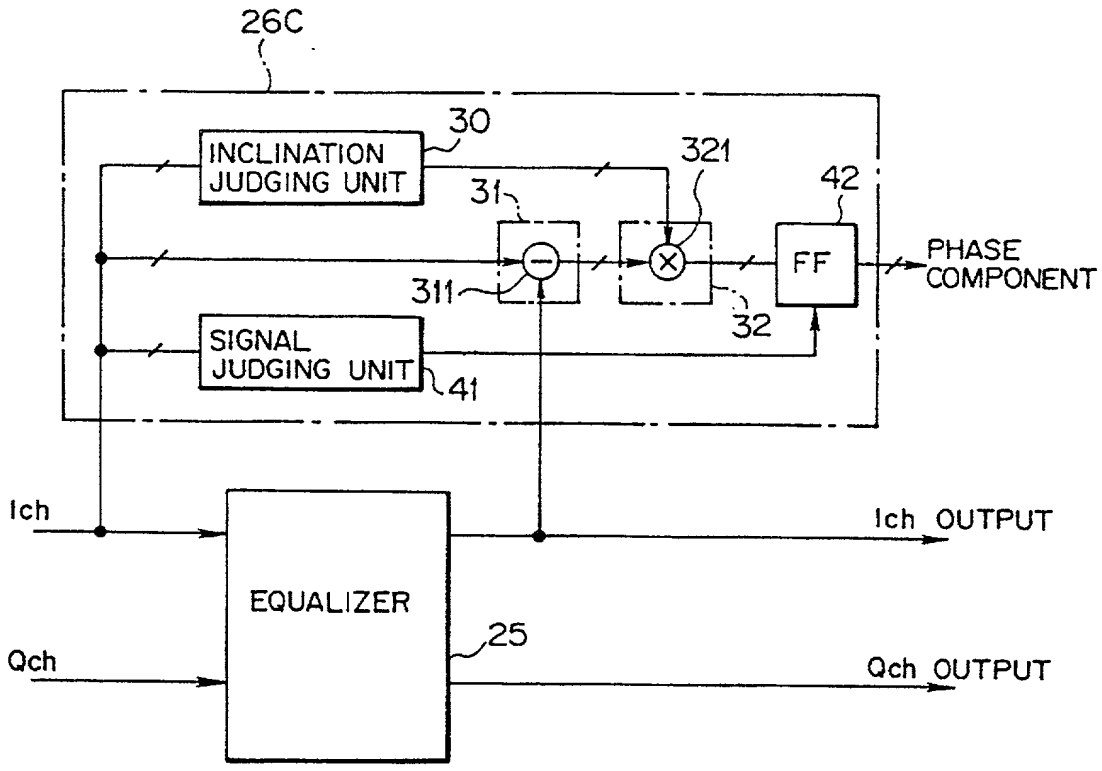

26C
30
INCLINATION JUDGING UNIT
321
42
31
FF
PHASE COMPONENT
311
32
SIGNAL JUDGING UNIT
41
Ich
Ich OUTPUT
EQUALIZER
25
Qch
Qch OUTPUT

FIG. 22

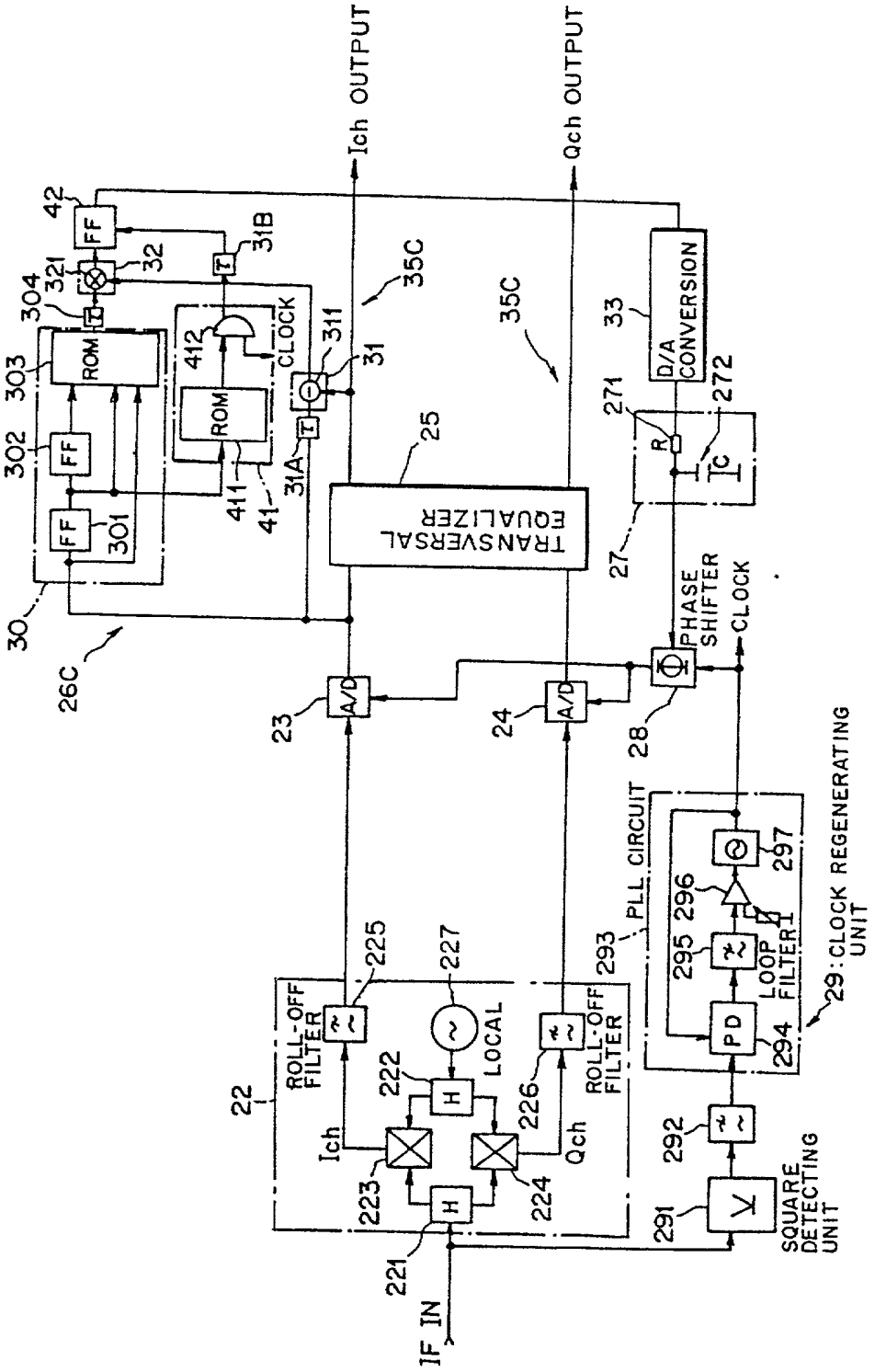

Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
25
35C
35C
D/A CONVERSION
33
271
272
R
Ic
27
PHASE SHIFTER
CLOCK
28
A/D
23
A/D
24
26C
30
42
FF
32
31B
304
321
303
ROM
302
FF
301
FF
412
CLOCK
ROM
411
41
31A
311
31
PLL CIRCUIT
293
297
296
295
LOOP FILTER
PD
294
29: CLOCK REGENERATING UNIT
ROLL-OFF FILTER
225
227
LOCAL
ROLL-OFF FILTER
226
22
222
H
Ich
Qch
223
224
H
221
IF IN
292
291
SQUARE DETECTING UNIT

FIG. 23

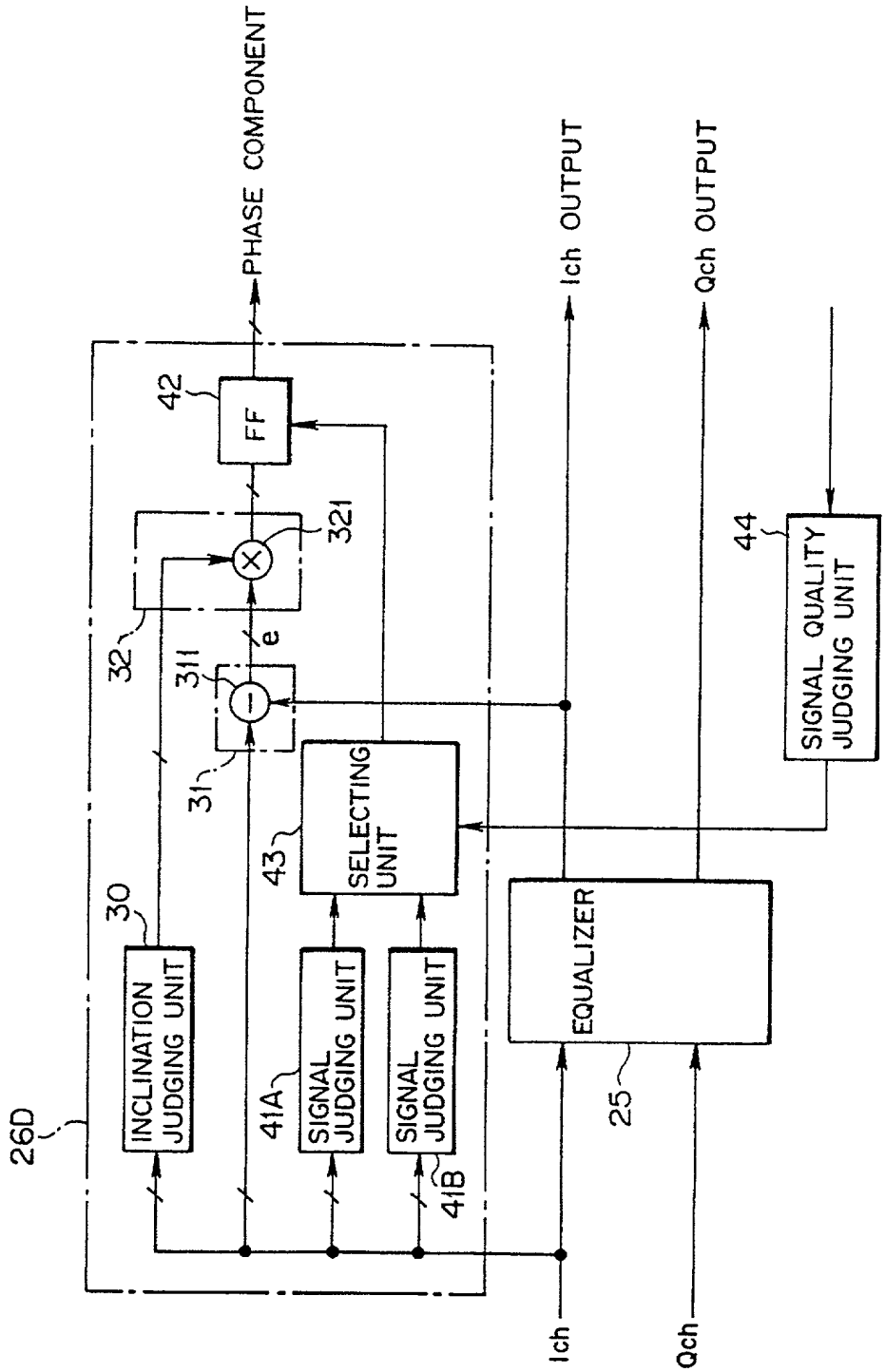

PHASE COMPONENT
Ich OUTPUT
Qch OUTPUT
42
FF
321
32
311
e
31
30
43
SELECTING UNIT
44
SIGNAL QUALITY JUDGING UNIT
INCLINATION JUDGING UNIT
41A
SIGNAL JUDGING UNIT
SIGNAL JUDGING UNIT
41B
EQUALIZER
25
26D
Ich
Qch

FIG. 24

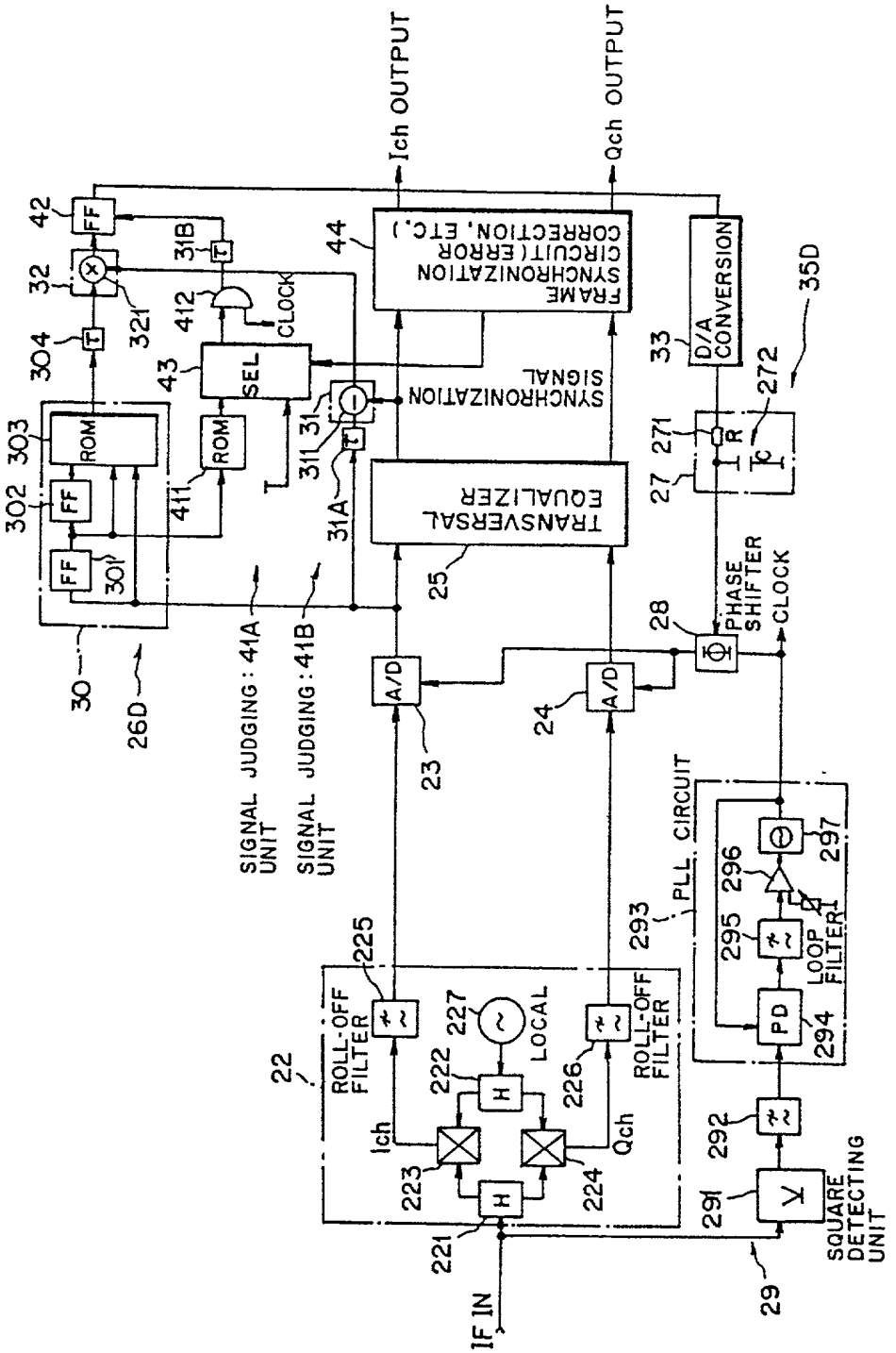
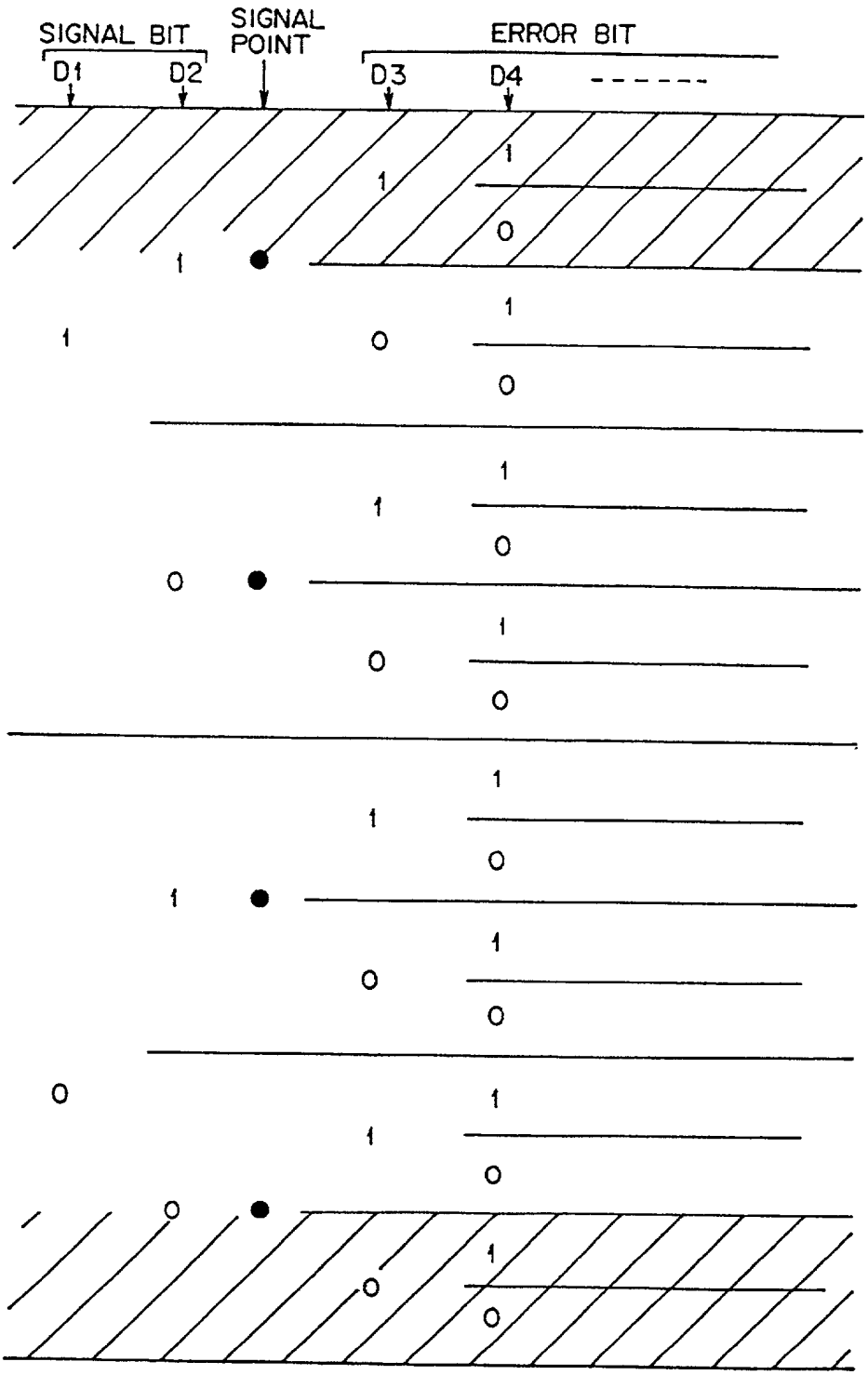

Ich OUTPUT
Qch OUTPUT
FRAME SYNCHRONIZATION CIRCUIT (ERROR CORRECTION, ETC.)
TRANSVERSAL EQUALIZER
SYNCHRONIZATION SIGNAL
D/A CONVERSION
PHASE SHIFTER
CLOCK
A/D
ROLL-OFF FILTER
LOCAL
PLL CIRCUIT
LOOP FILTER
PD
SQUARE DETECTING UNIT
SIGNAL JUDGING UNIT
SIGNAL JUDGING : 41A
SIGNAL JUDGING : 41B
ROM
SEL
CLOCK
IF IN
Ich
Qch

FIG. 25



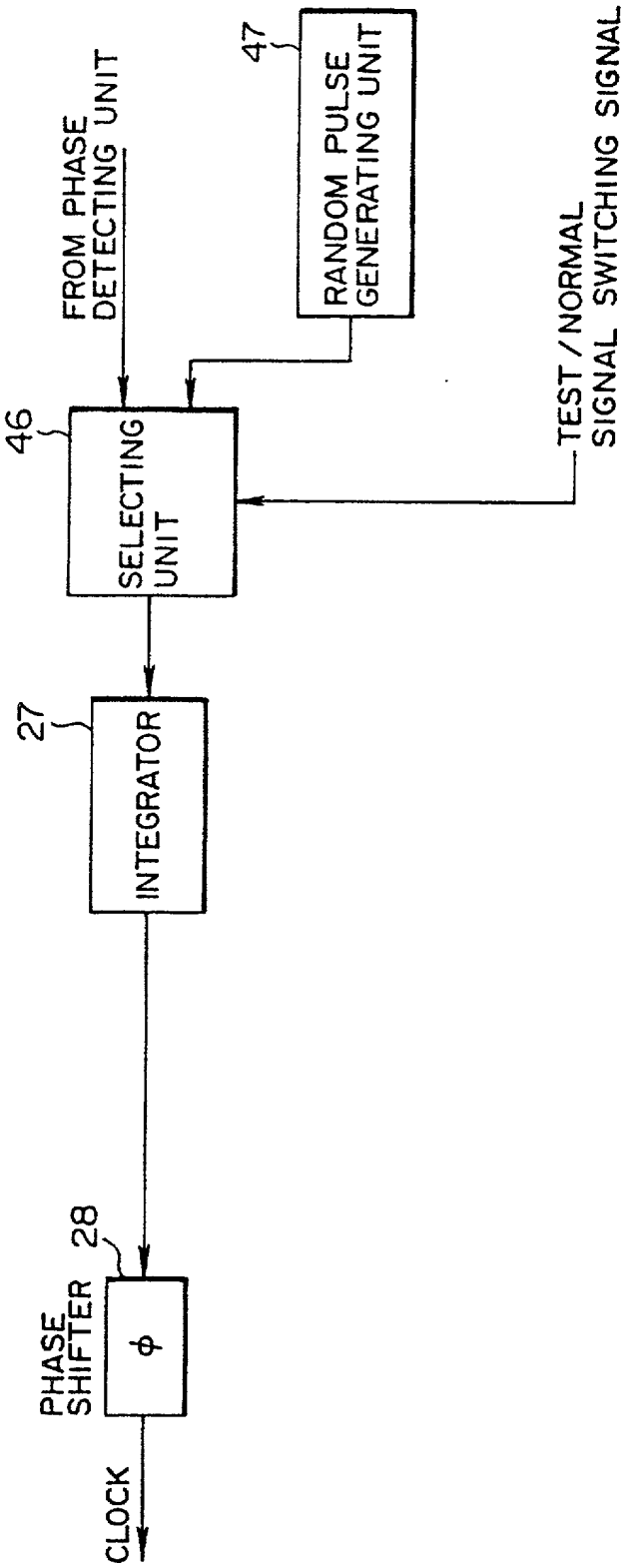

FROM PHASE DETECTING UNIT
47
RANDOM PULSE GENERATING UNIT
TEST / NORMAL SIGNAL SWITCHING SIGNAL
46
SELECTING UNIT
27
INTEGRATOR
28
PHASE SHIFTER
φ
CLOCK

FIG. 26

FIG. 27

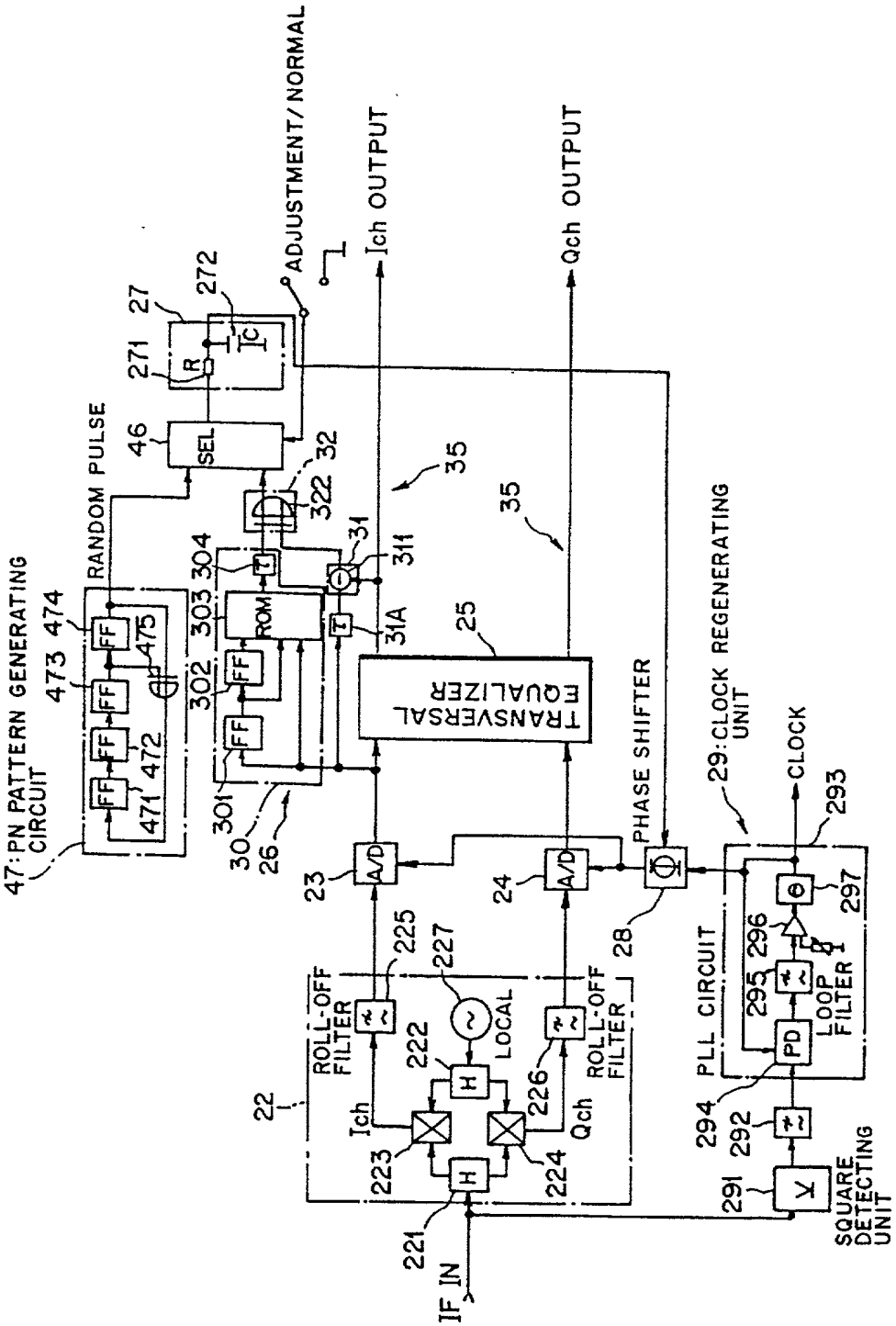

47:PN PATTERN GENERATING CIRCUIT
RANDOM PULSE
ADJUSTMENT/NORMAL
Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
PHASE SHIFTER
29:CLOCK REGENERATING UNIT
CLOCK
PLL CIRCUIT
LOOP FILTER
ROLL-OFF FILTER
LOCAL
SQUARE DETECTING UNIT
IF IN
A/D
ROM
SEL
PD

FIG. 28

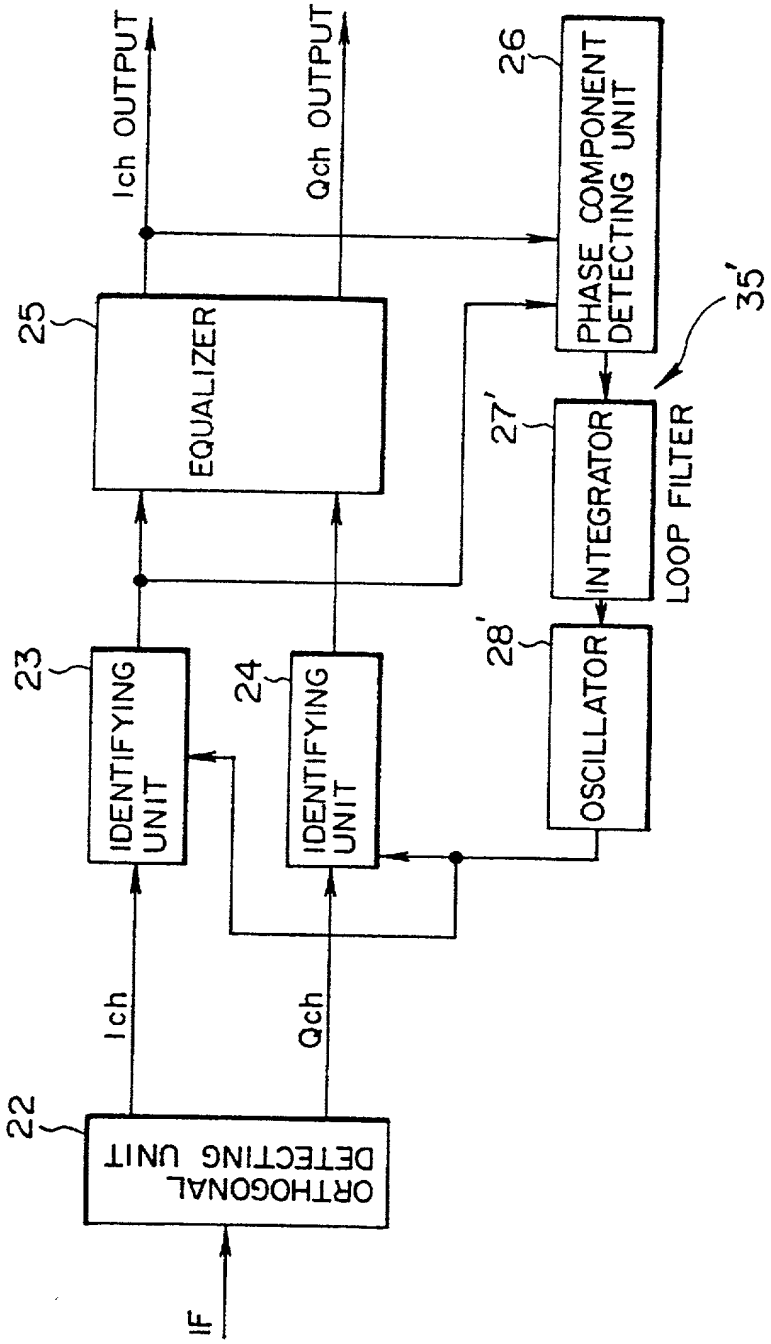

Ich OUTPUT
Qch OUTPUT
26
PHASE COMPONENT DETECTING UNIT
35'
25
EQUALIZER
27'
INTEGRATOR
LOOP FILTER
28'
OSCILLATOR
23
IDENTIFYING UNIT
24
IDENTIFYING UNIT
Ich
Qch
22
ORTHOGONAL DETECTING UNIT
IF

FIG. 29

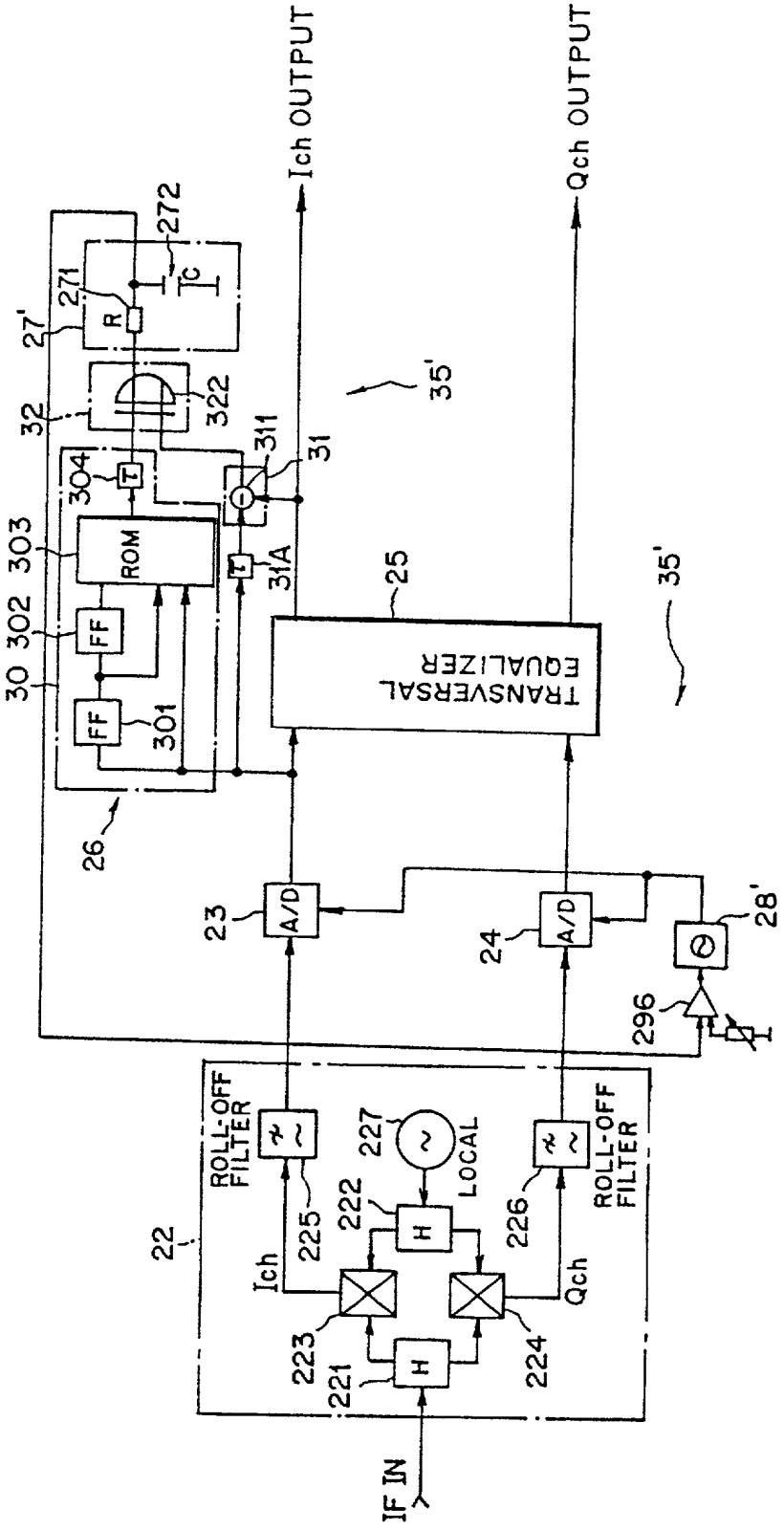

Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
ROM
FF
FF
A/D
A/D
ROLL-OFF FILTER
ROLL-OFF FILTER
LOCAL
IF IN
Ich
Qch
H
H
R
T
22
23
24
25
26
27'
28'
30
31
31A
32
35'
221
222
223
224
225
226
227
271
272
296
301
302
303
304
311
322

FIG. 30

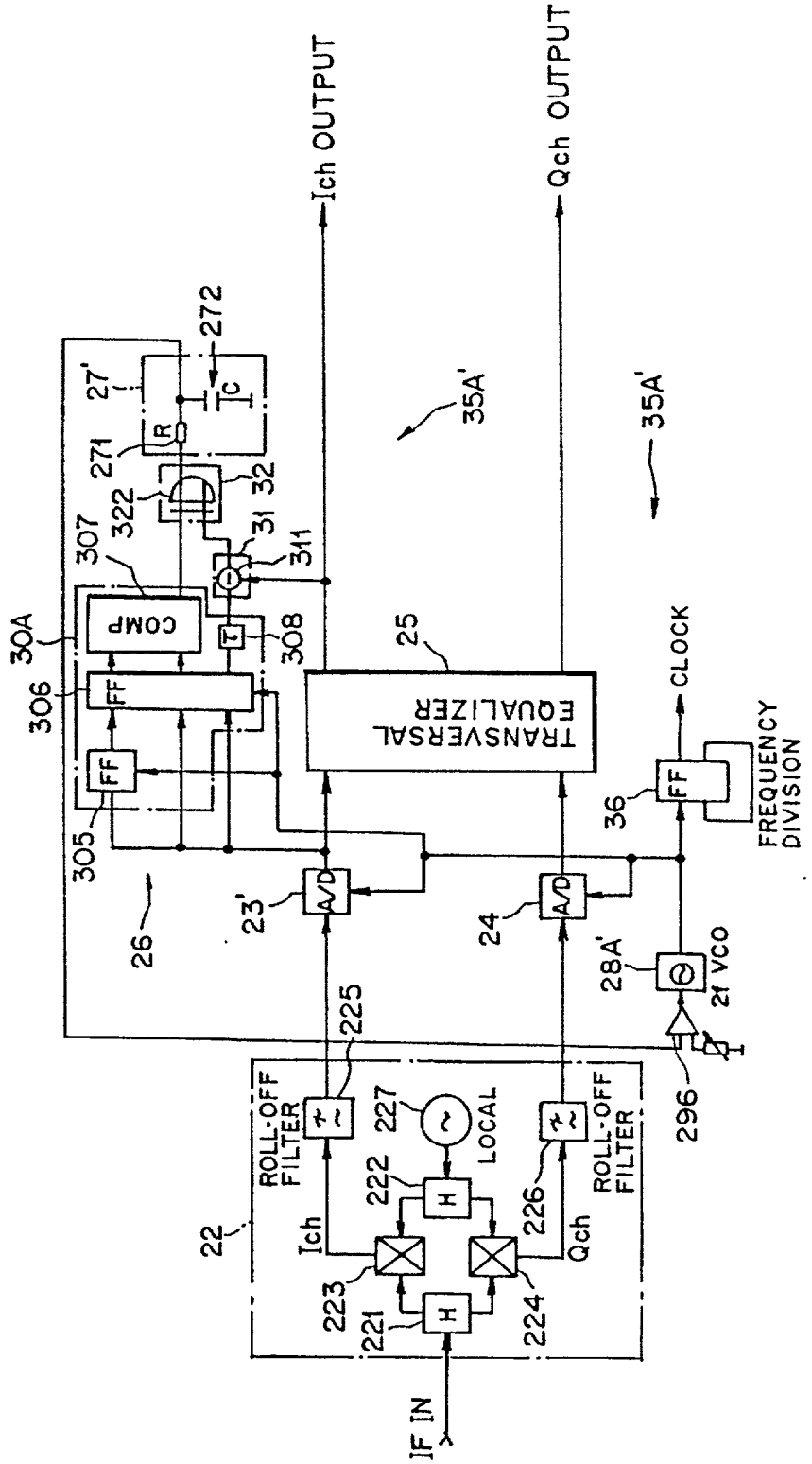

Ich OUTPUT
Qch OUTPUT
35A'
35A'
272
27'
271
32
322
31
311
307
30A
306
305
COMP
FF
FF
308
25
TRANSVERSAL EQUALIZER
CLOCK
FREQUENCY DIVISION
36
FF
26
23'
A/D
24
A/D
28A'
21' VCO
225
227
LOCAL
ROLL-OFF FILTER
ROLL-OFF FILTER
296
22
Ich
Qch
222
226
223
224
221
IF IN

FIG. 31

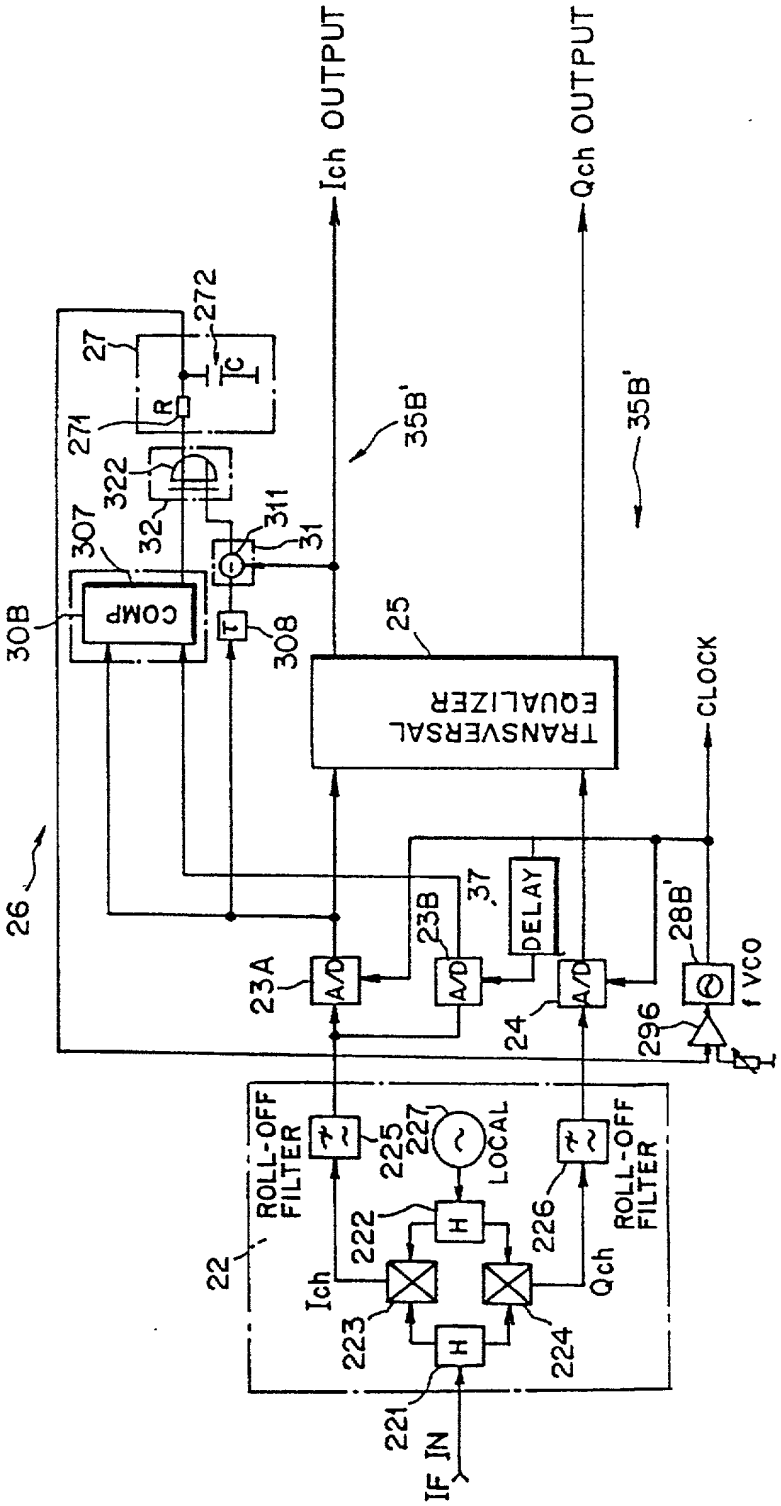

Ich OUTPUT
Qch OUTPUT
35B'
35B'
272
27
271
322
32
311
31
307
COMP
30B
308
25
TRANSVERSAL EQUALIZER
CLOCK
26
23B
37
DELAY
28B'
23A
A/D
24
296
f VCO
ROLL-OFF FILTER
225
227
LOCAL
222
226
22
Ich
Qch
223
224
221
IF IN

FIG. 32

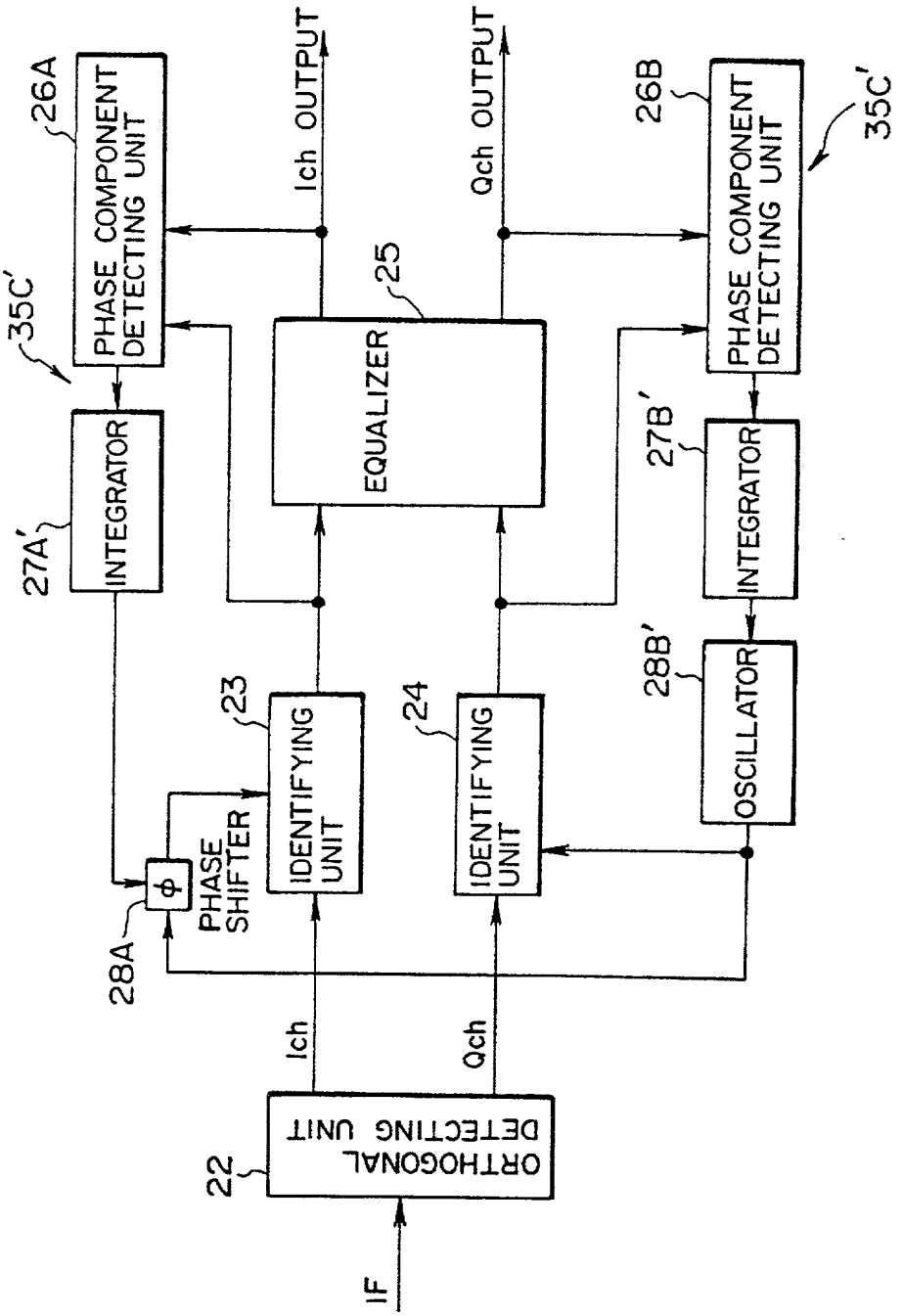

IF
ORTHOGONAL DETECTING UNIT
22
Ich
Qch
IDENTIFYING UNIT
23
IDENTIFYING UNIT
24
EQUALIZER
25
PHASE SHIFTER
28A
INTEGRATOR
27A'
INTEGRATOR
27B'
OSCILLATOR
28B'
PHASE COMPONENT DETECTING UNIT
26A
PHASE COMPONENT DETECTING UNIT
26B
35C'
35C'
Ich OUTPUT
Qch OUTPUT

FIG. 33

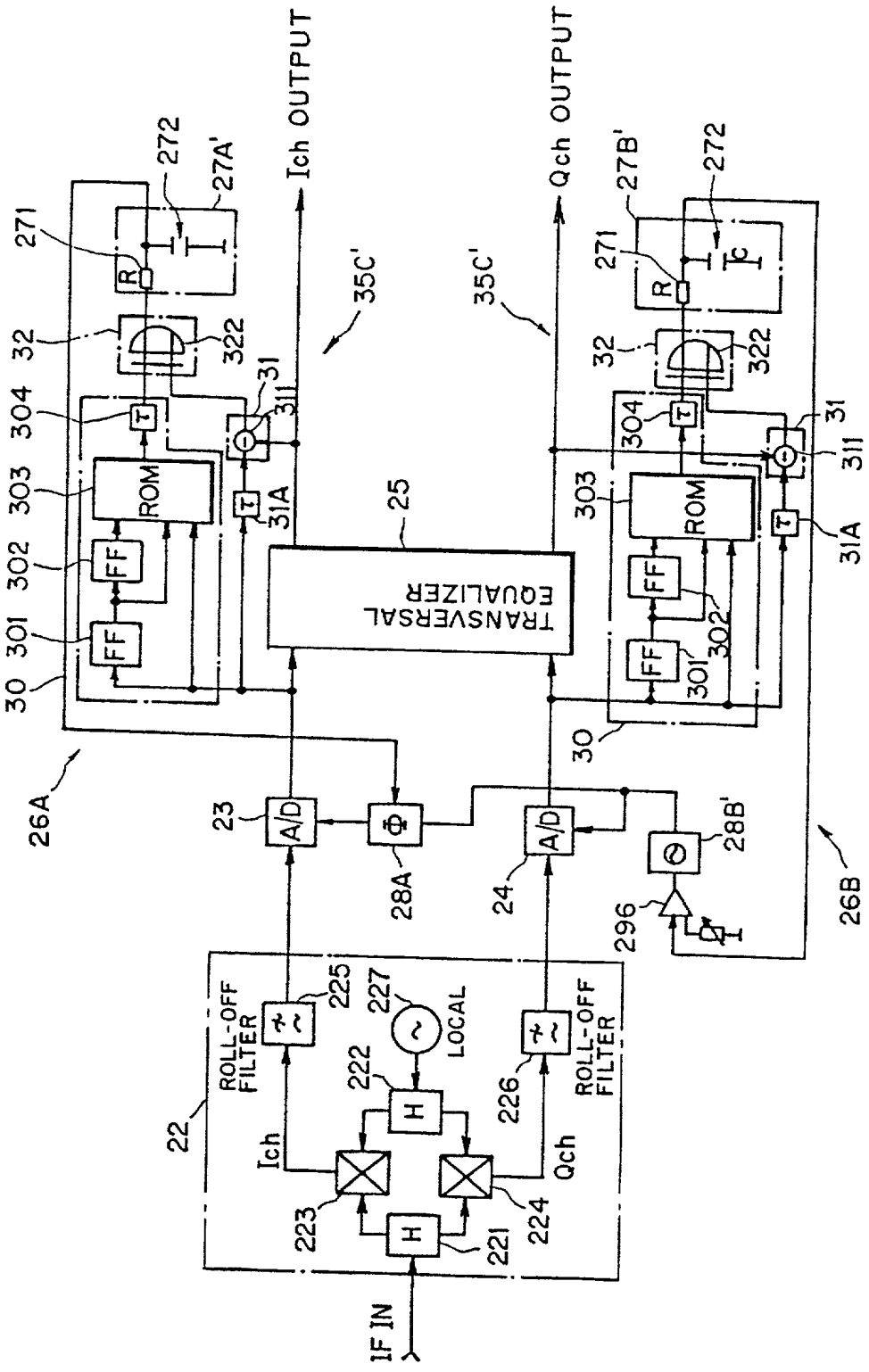

Ich OUTPUT
Qch OUTPUT
35C'
35C'
272
27A'
271
R
I
32
322
31
311
304
303
ROM
302
FF
301
30
31A
τ
25
TRANSVERSAL EQUALIZER
26A
23
A/D
Φ
28A
24
A/D
Θ
28B'
26B
296
I
ROLL-OFF FILTER
225
227
LOCAL
222
H
226
ROLL-OFF FILTER
22
Ich
Qch
223
224
221
IF IN

FIG. 34

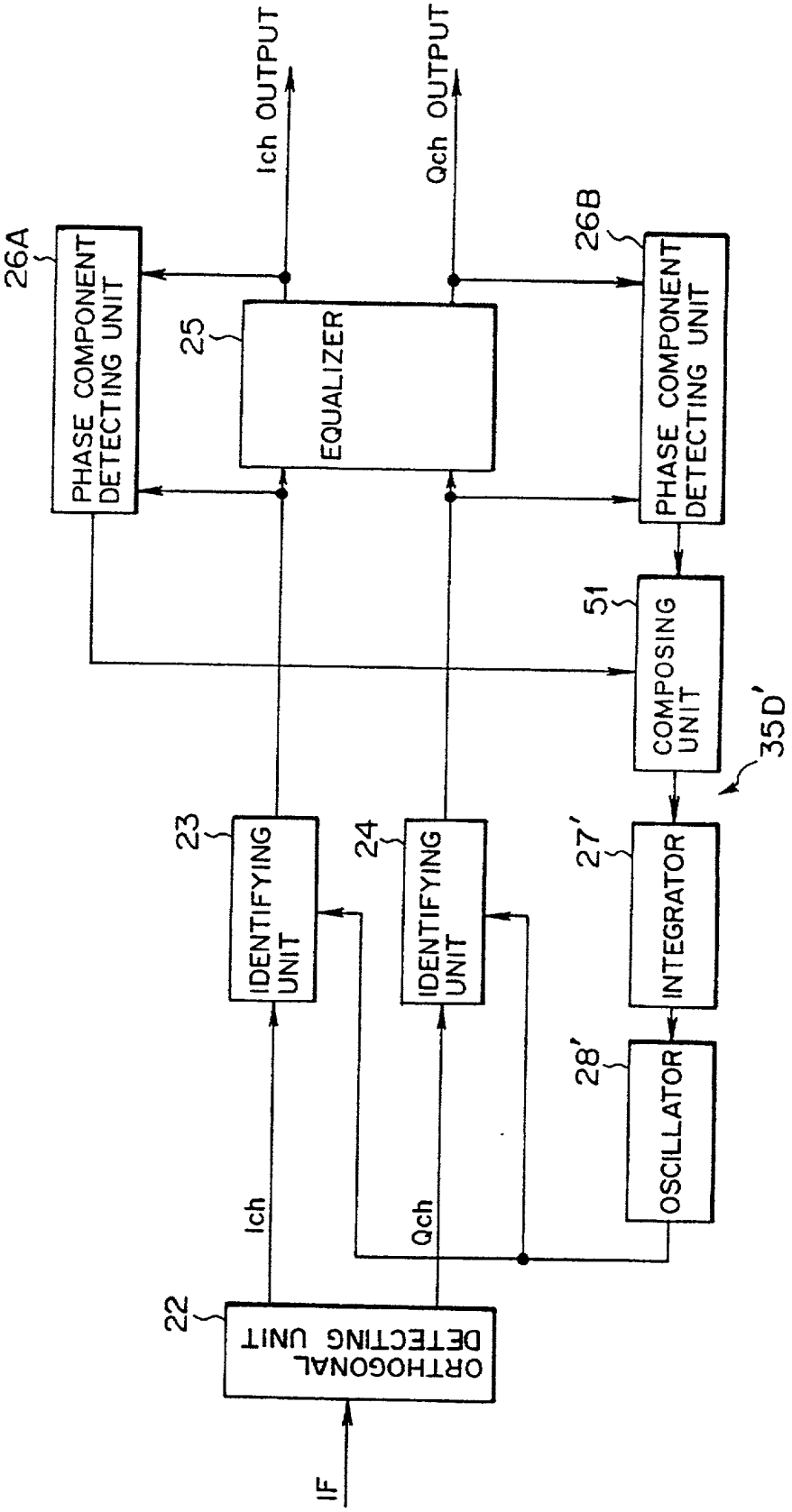

Ich OUTPUT
Qch OUTPUT
26A
PHASE COMPONENT DETECTING UNIT
25
EQUALIZER
26B
PHASE COMPONENT DETECTING UNIT
51
COMPOSING UNIT
35D'
23
IDENTIFYING UNIT
24
IDENTIFYING UNIT
27'
INTEGRATOR
28'
OSCILLATOR
Ich
Qch
22
ORTHOGONAL DETECTING UNIT
IF

FIG. 35

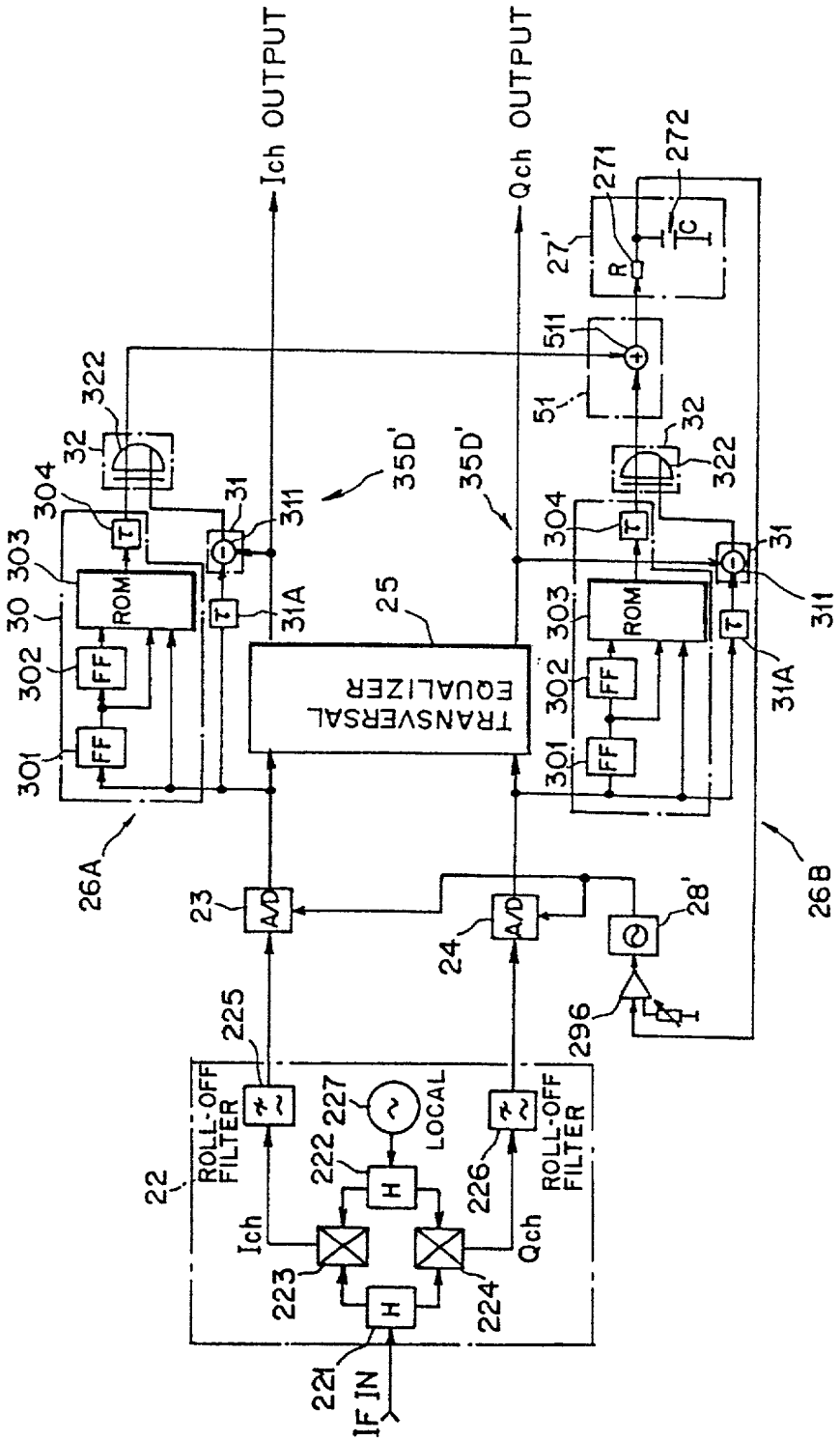

Ich OUTPUT
Qch OUTPUT
TRANSVERSAL EQUALIZER
ROM
FF
A/D
ROLL-OFF FILTER
LOCAL
IF IN
Ich
Qch

FIG. 36

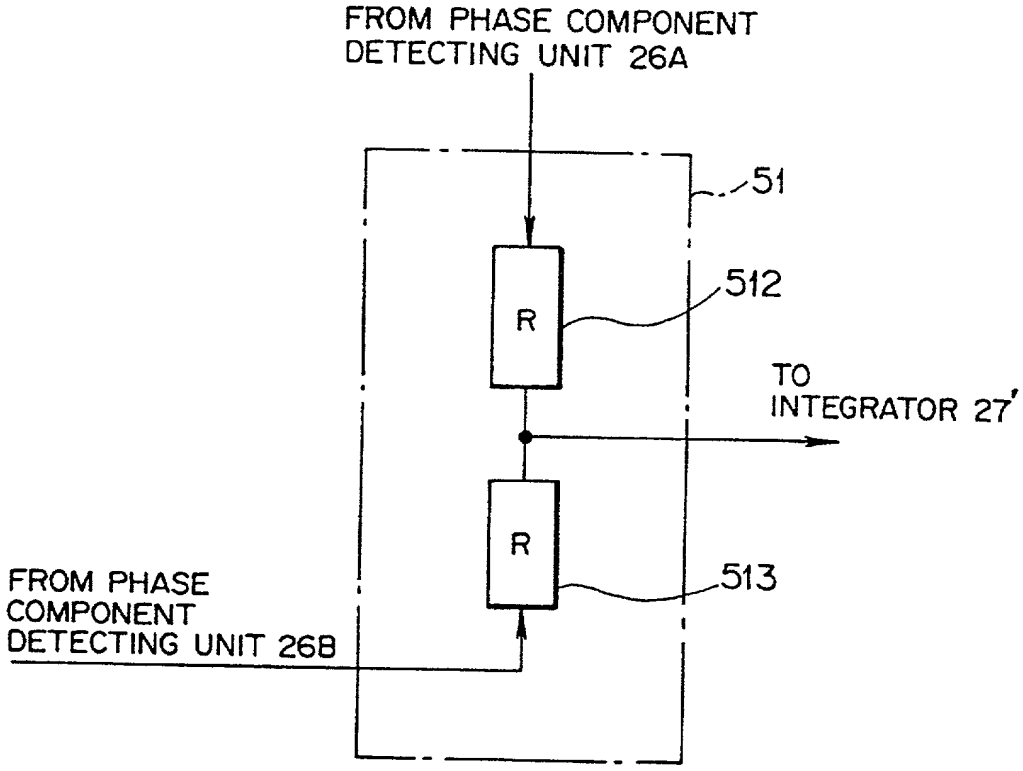

FROM PHASE COMPONENT DETECTING UNIT 26A
51
512
R
TO INTEGRATOR 27'
R
513
FROM PHASE COMPONENT DETECTING UNIT 26B

FIG.37

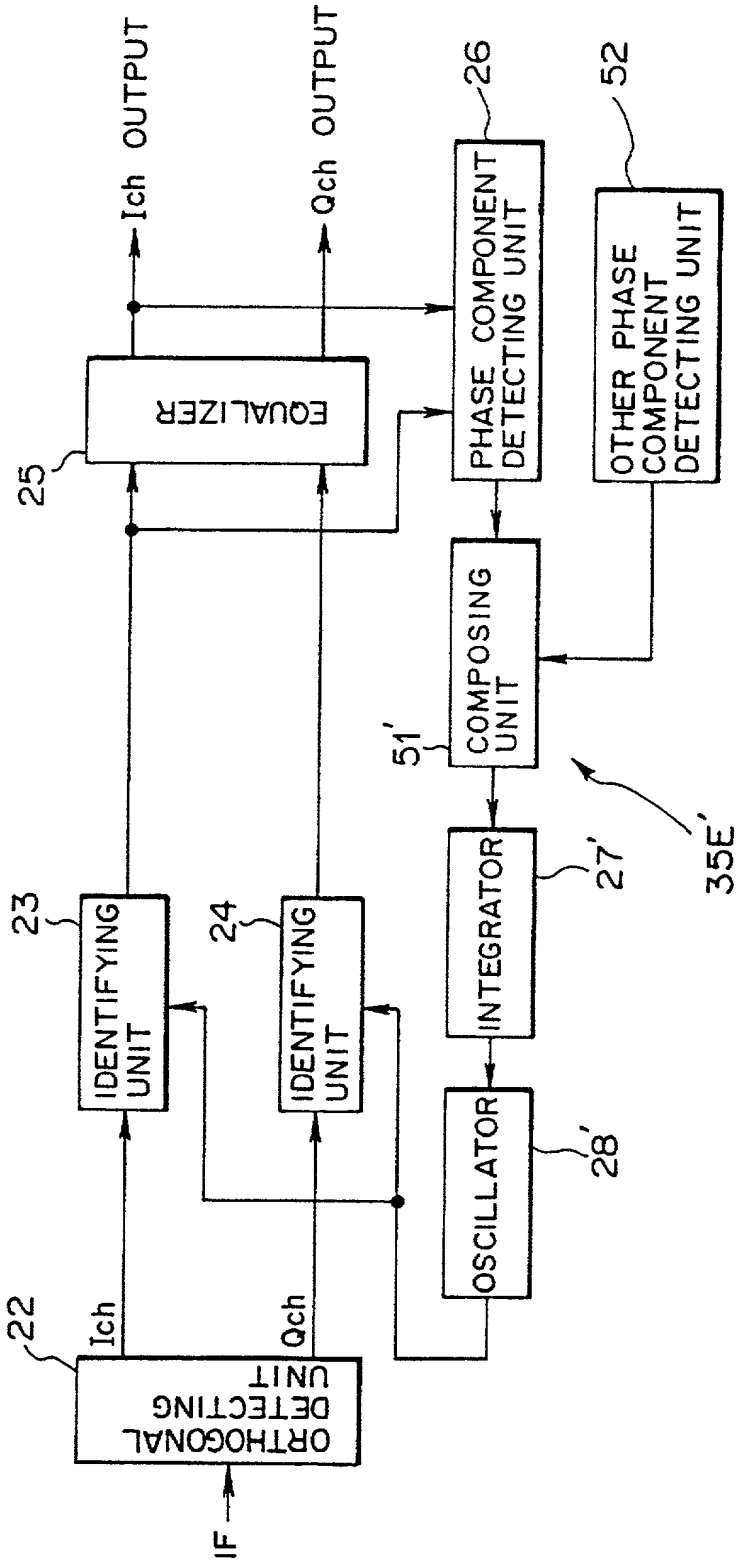

Ich OUTPUT
Qch OUTPUT
26
52
PHASE COMPONENT DETECTING UNIT
OTHER PHASE COMPONENT DETECTING UNIT
EQUALIZER
25
COMPOSING UNIT
51'
35E'
INTEGRATOR
27'
OSCILLATOR
28'
23
24
IDENTIFYING UNIT
IDENTIFYING UNIT
22
Ich
Qch
ORTHOGONAL DETECTING UNIT
IF

FIG. 38

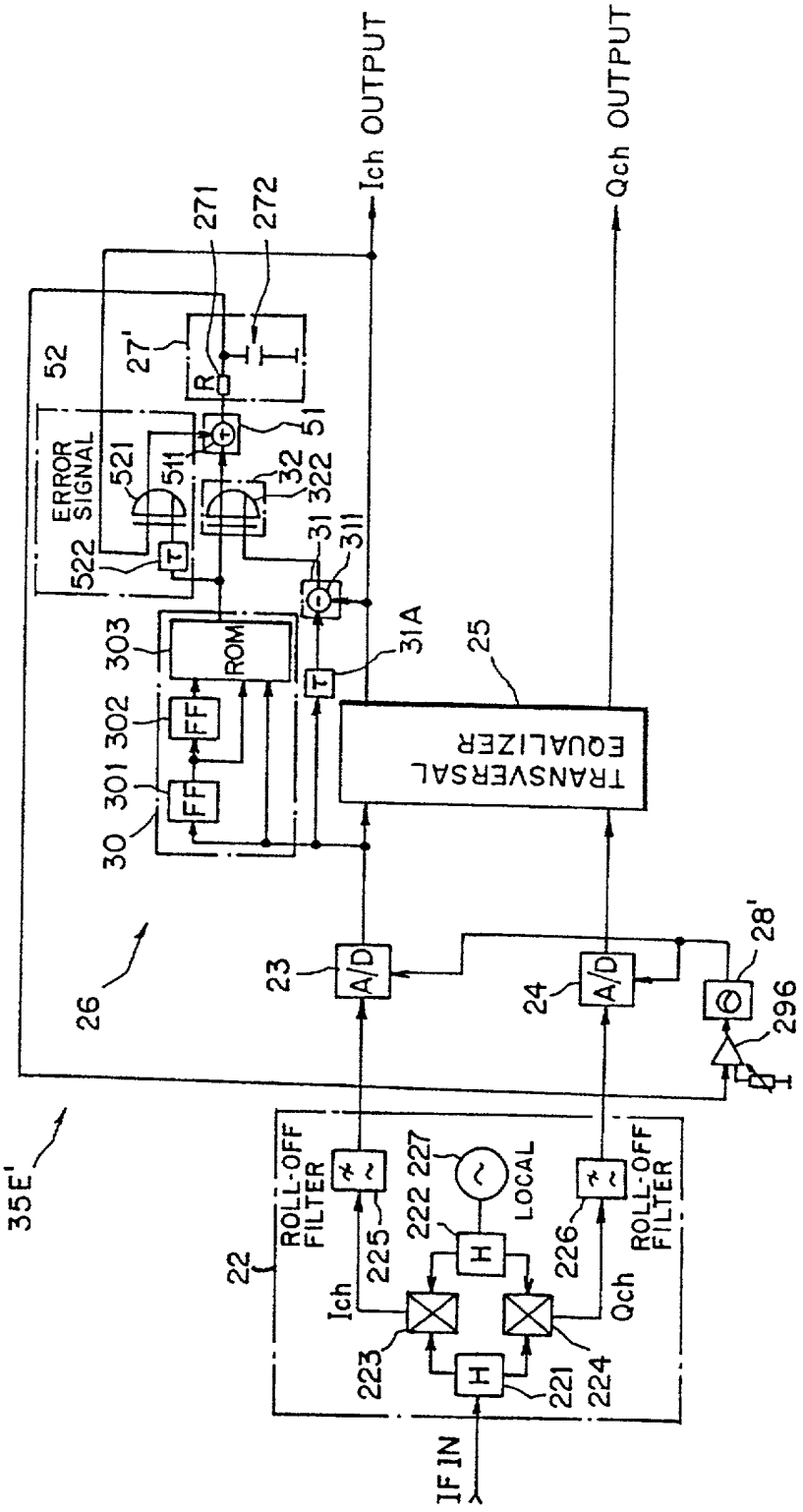

Ich OUTPUT
Qch OUTPUT
271
272
27'
52
ERROR SIGNAL
521
511
522
51
32
322
31
311
303
ROM
31A
25
302
FF
301
30
TRANSVERSAL EQUALIZER
26
23
A/D
24
28'
296
35E'
ROLL-OFF FILTER
22
225
222
227
LOCAL
226
Ich
Qch
223
221
224
IF IN

FIG.39

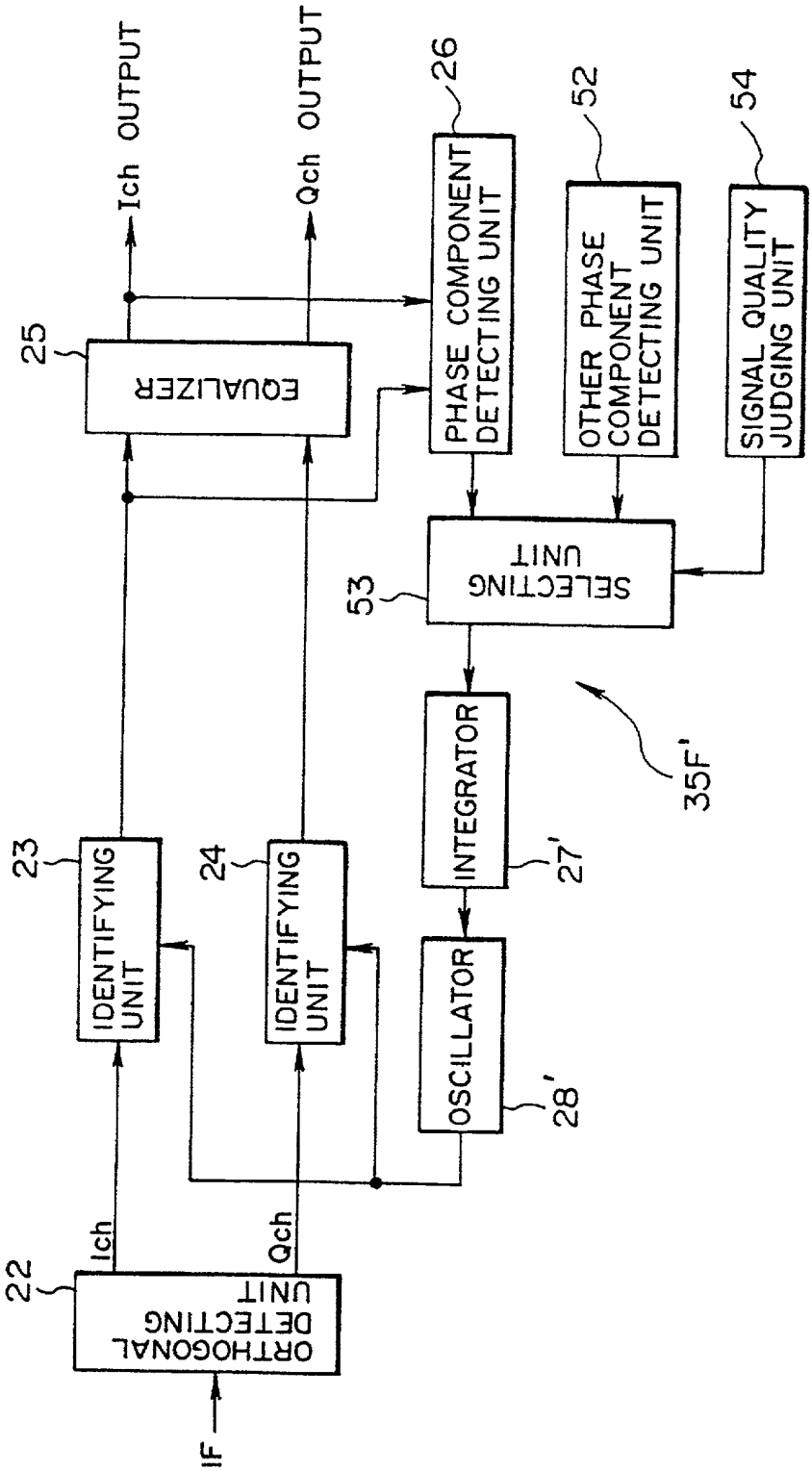
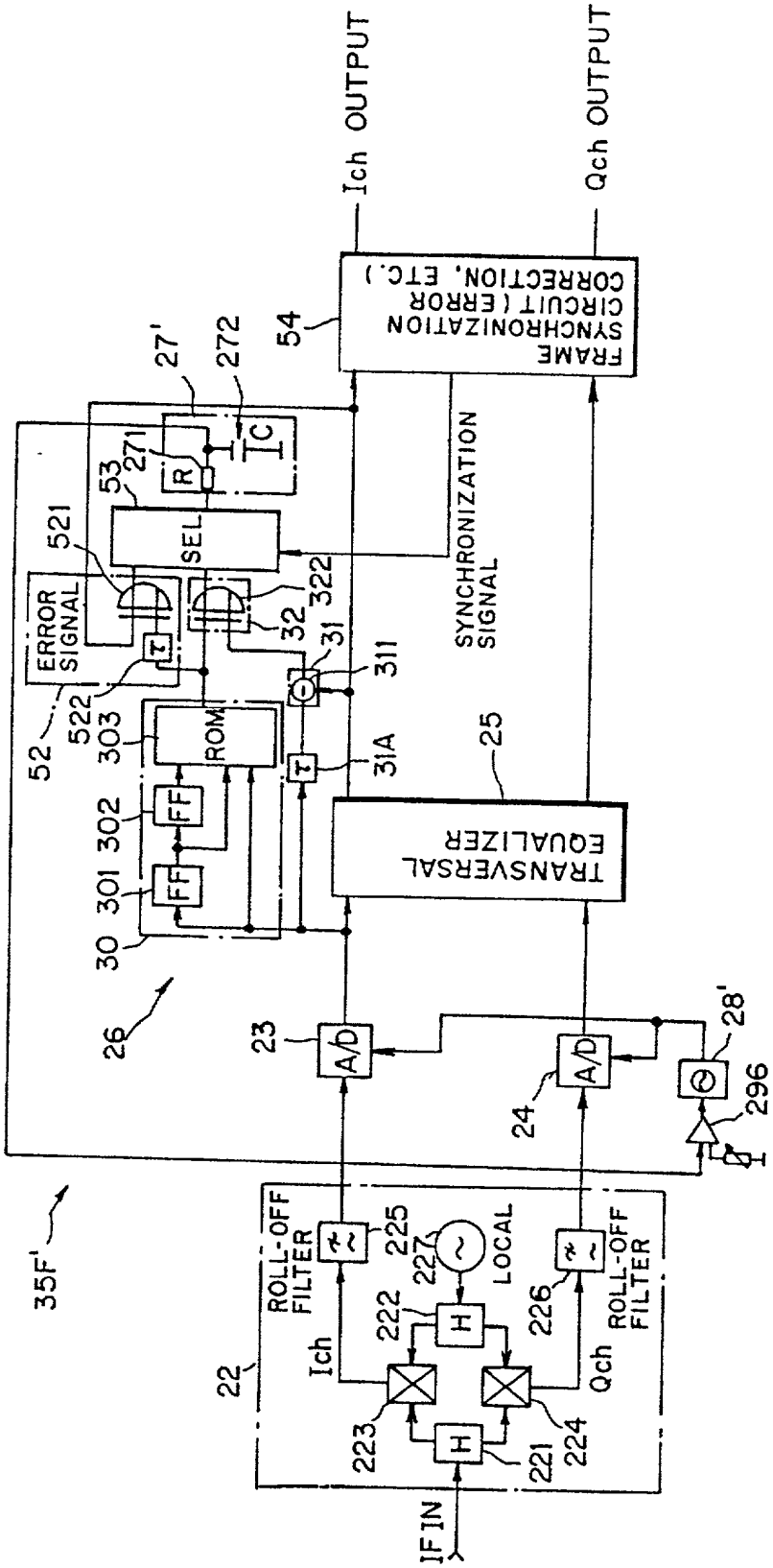

IF
ORTHOGONAL DETECTING UNIT
22
Ich
Qch
IDENTIFYING UNIT
23
IDENTIFYING UNIT
24
OSCILLATOR
28'
INTEGRATOR
27'
35F'
SELECTING UNIT
53
PHASE COMPONENT DETECTING UNIT
26
OTHER PHASE COMPONENT DETECTING UNIT
52
SIGNAL QUALITY JUDGING UNIT
54
EQUALIZER
25
Ich OUTPUT
Qch OUTPUT

FIG. 40



Tokyo "6247650

FIG. 41

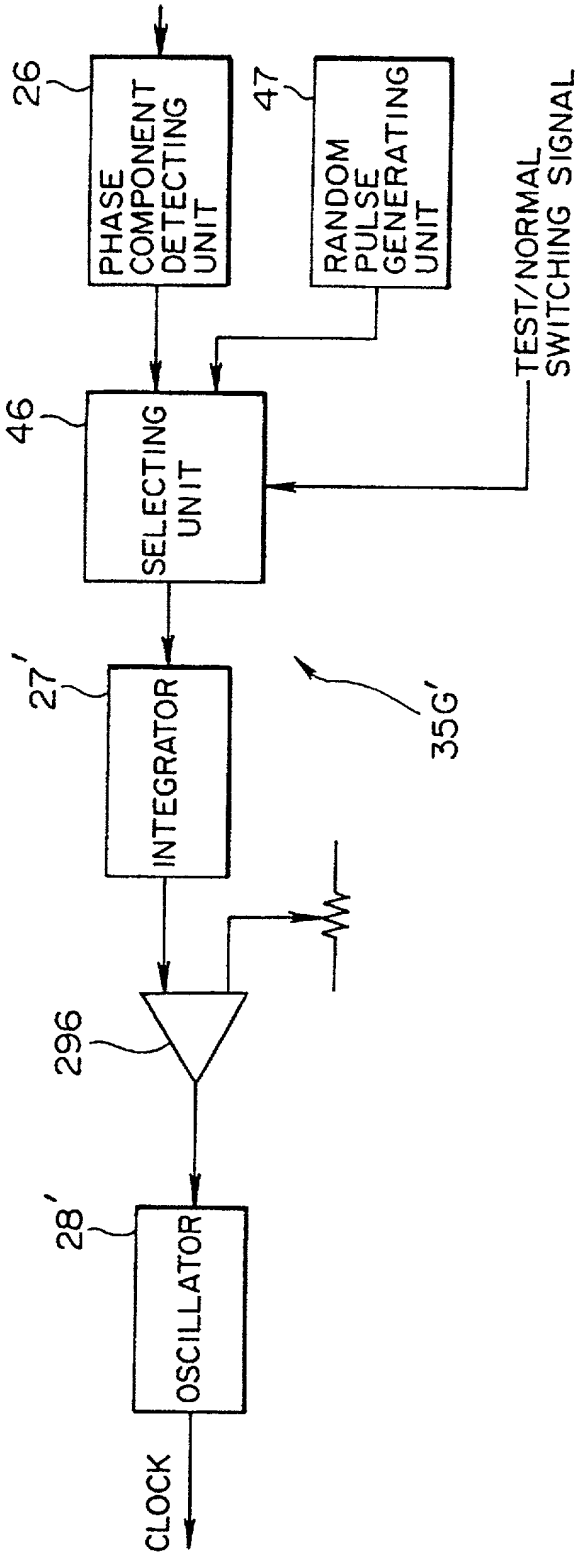

26
PHASE COMPONENT DETECTING UNIT
47
RANDOM PULSE GENERATING UNIT
TEST/NORMAL SWITCHING SIGNAL
46
SELECTING UNIT
27'
INTEGRATOR
35G'
296
28'
OSCILLATOR
CLOCK

FIG. 42

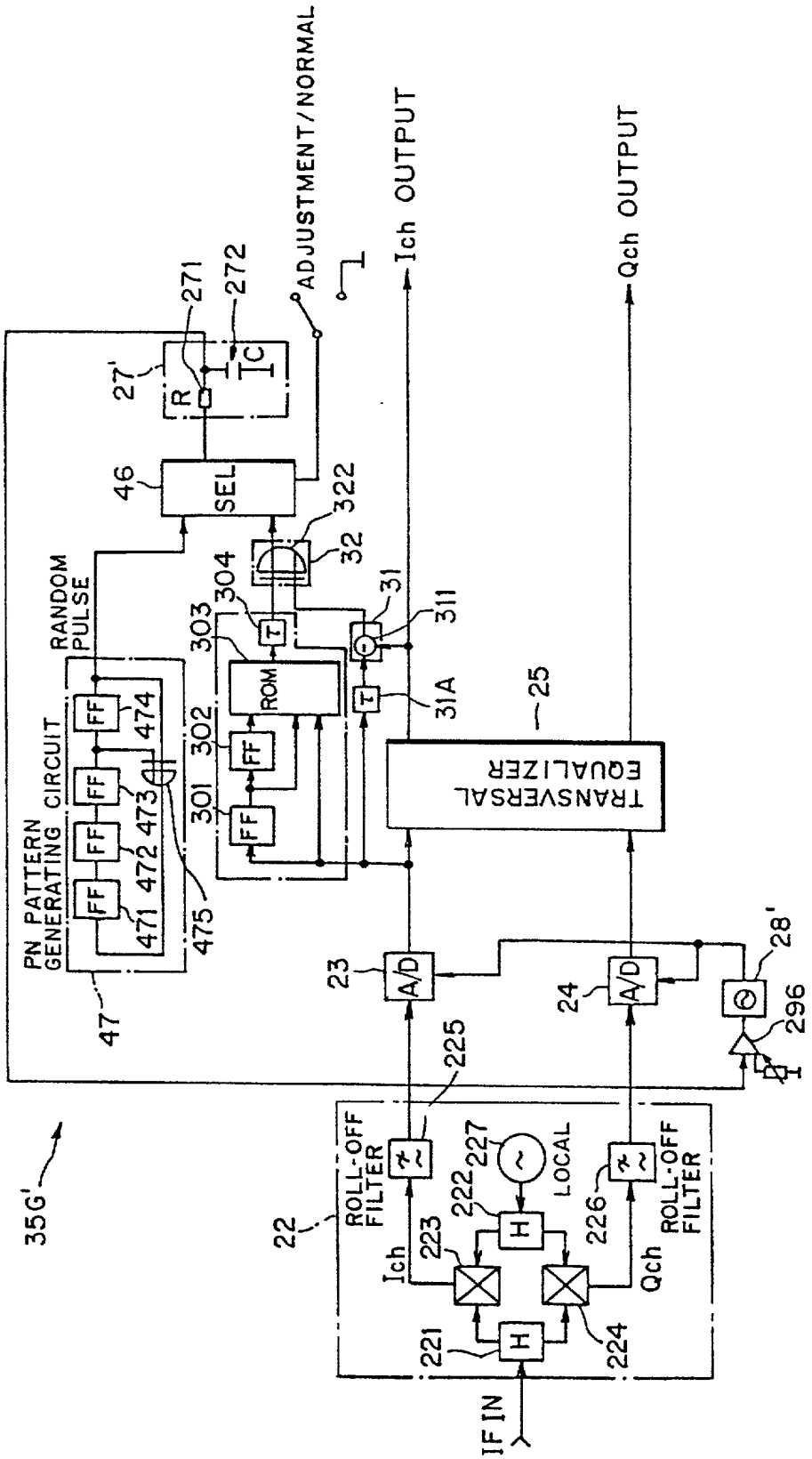

35G'
22
ROLL-OFF FILTER
Ich
Qch
ROLL-OFF FILTER
LOCAL
IF IN
221
222
223
224
225
226
227
H
23
24
A/D
A/D
28'
296
I
TRANSVERSAL EQUALIZER
25
31
31A
311
32
322
ROM
303
304
301
302
PN PATTERN GENERATING CIRCUIT
RANDOM PULSE
471
472
473
474
475
47
FF
T
46
SEL
27'
R
TC
271
272
ADJUSTMENT/NORMAL
Ich OUTPUT
Qch OUTPUT

FIG.43

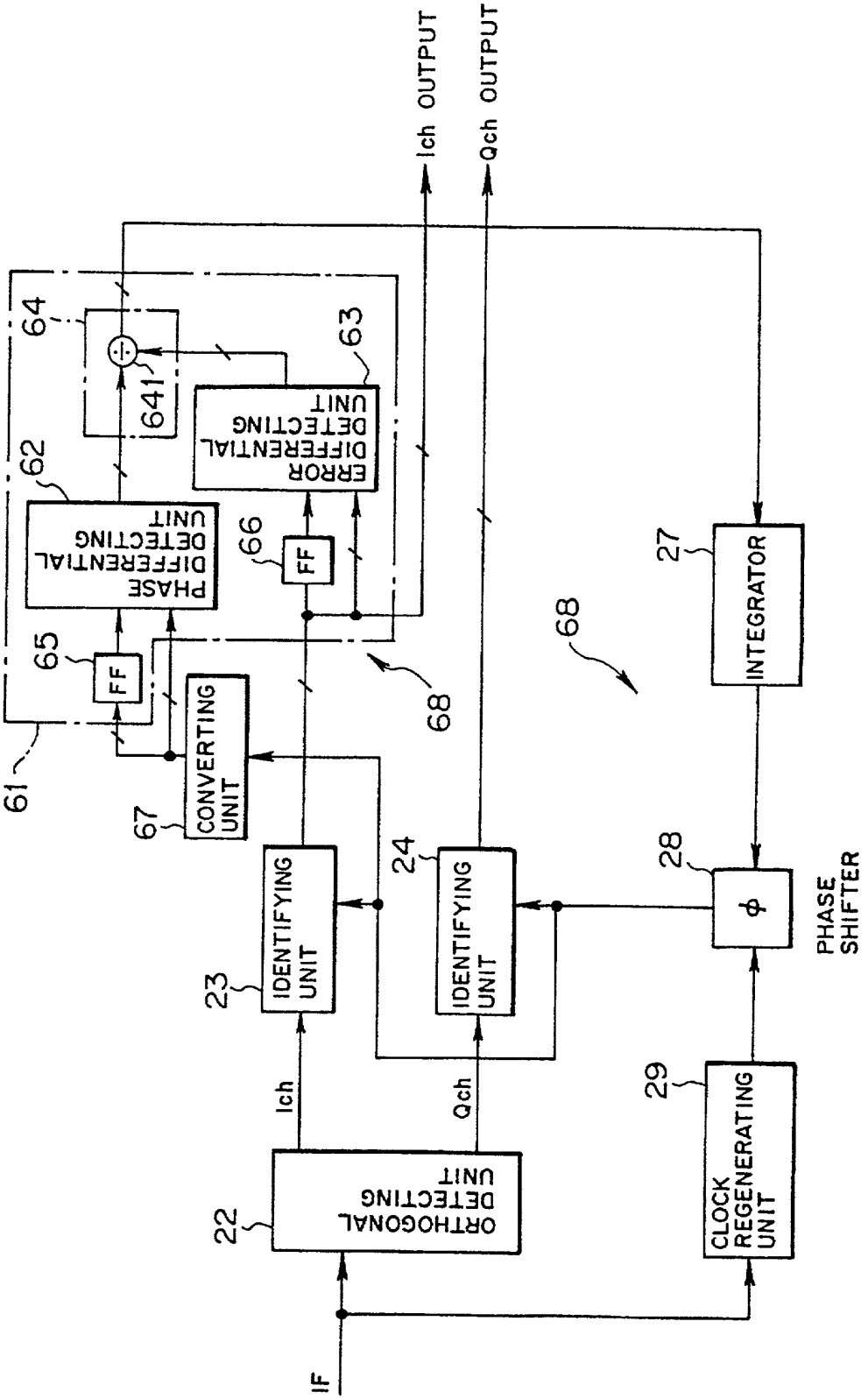

Ich OUTPUT
Qch OUTPUT
64
63
641
ERROR DIFFERENTIAL DETECTING UNIT
62
PHASE DIFFERENTIAL DETECTING UNIT
66
FF
65
FF
68
27
INTEGRATOR
68
61
CONVERTING UNIT
67
24
IDENTIFYING UNIT
28
ϕ
PHASE SHIFTER
23
IDENTIFYING UNIT
Ich
Qch
29
CLOCK REGENERATING UNIT
22
ORTHOGONAL DETECTING UNIT
IF

FIG. 44

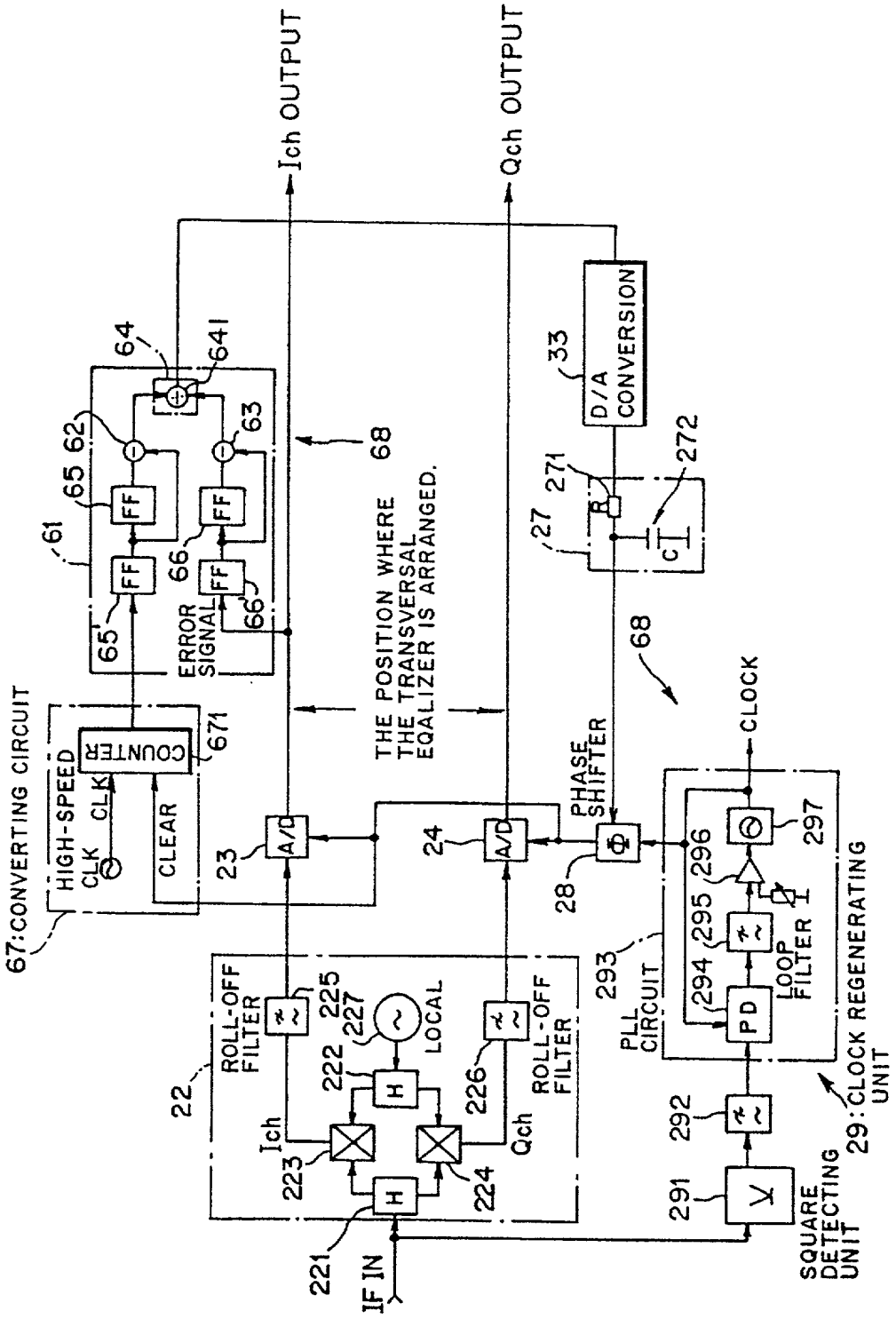

Ich OUTPUT
Qch OUTPUT
THE POSITION WHERE THE TRANSVERSAL EQALIZER IS ARRANGED.
67:CONVERTING CIRCUIT
HIGH-SPEED CLK
CLK
CLEAR
COUNTER
671
ERROR SIGNAL
FF
61
62
63
64
641
65
66
D/A CONVERSION
33
271
272
27
68
PHASE SHIFTER
28
A/D
23
24
CLOCK
ROLL-OFF FILTER
22
225
227
LOCAL
222
226
Ich
Qch
223
224
221
IF IN
H
PLL CIRCUIT
293
294
295
296
297
PD
LOOP FILTER
292
291
SQUARE DETECTING UNIT
29:CLOCK REGENERATING UNIT

FIG. 45

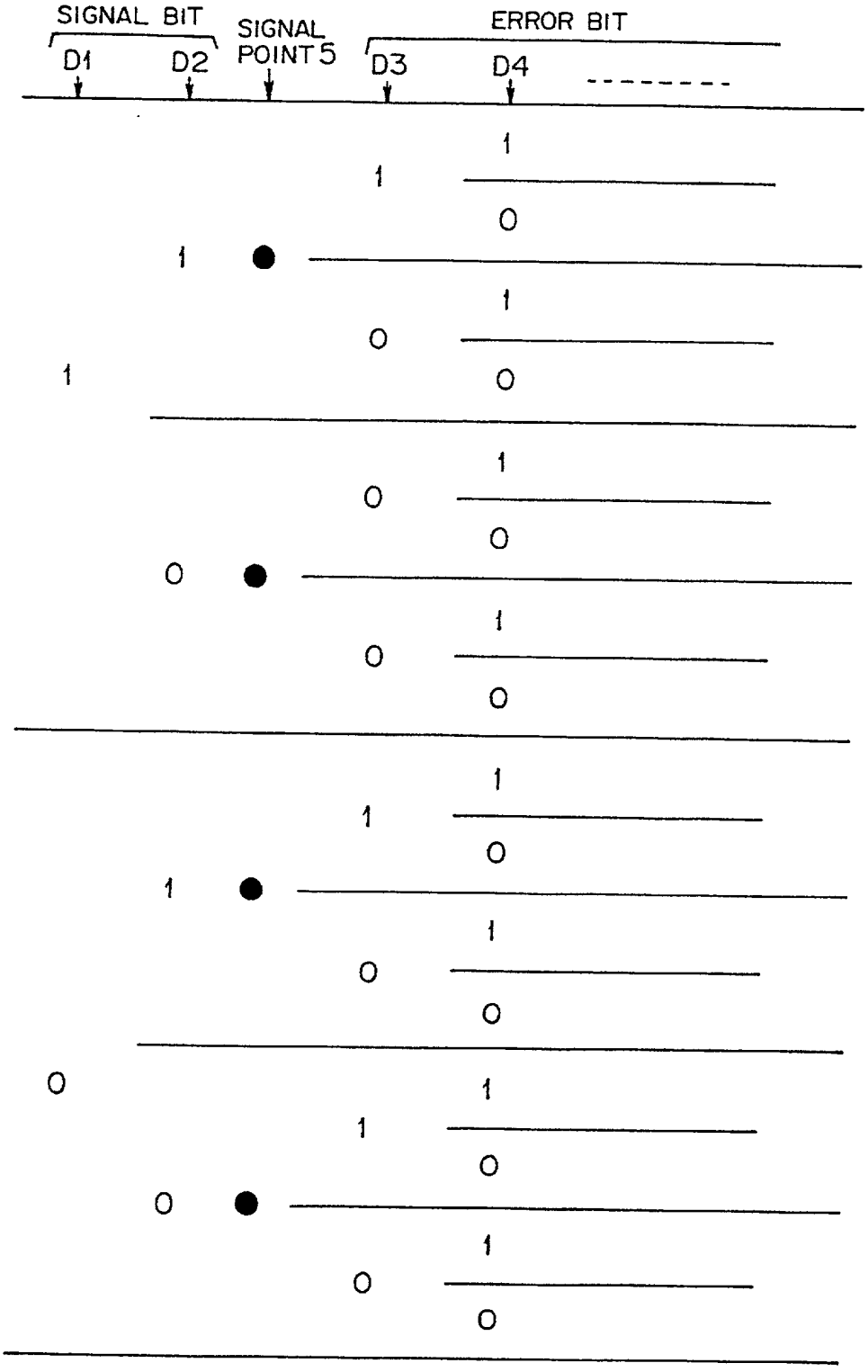

SIGNAL BIT
D1
D2
SIGNAL POINT 5
ERROR BIT
D3
D4
1
1
1
0
1
1
0
1
0
1
0
0
1
0
1
0
1
1
1
0
1
0
1
0
0
1
0
1
0
1
1
1
0
1
0
1
0
0
1
0
1
0

FIG.46

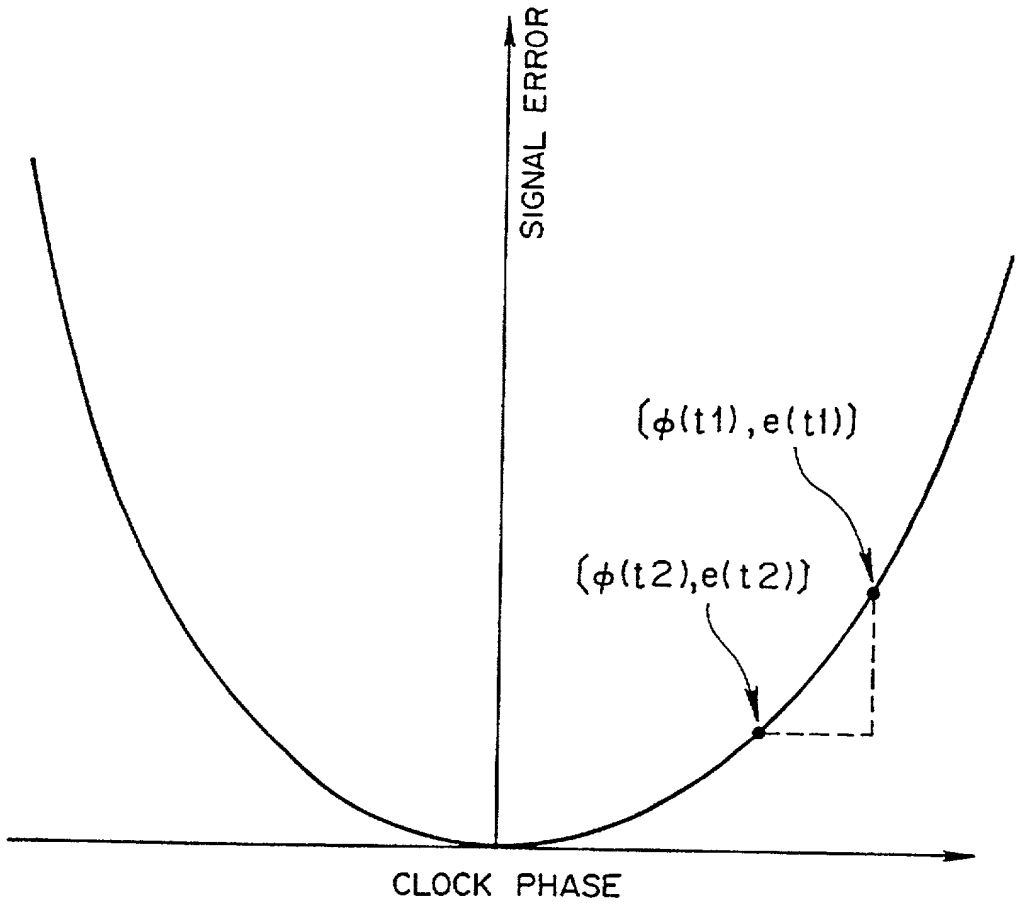


FIG. 47

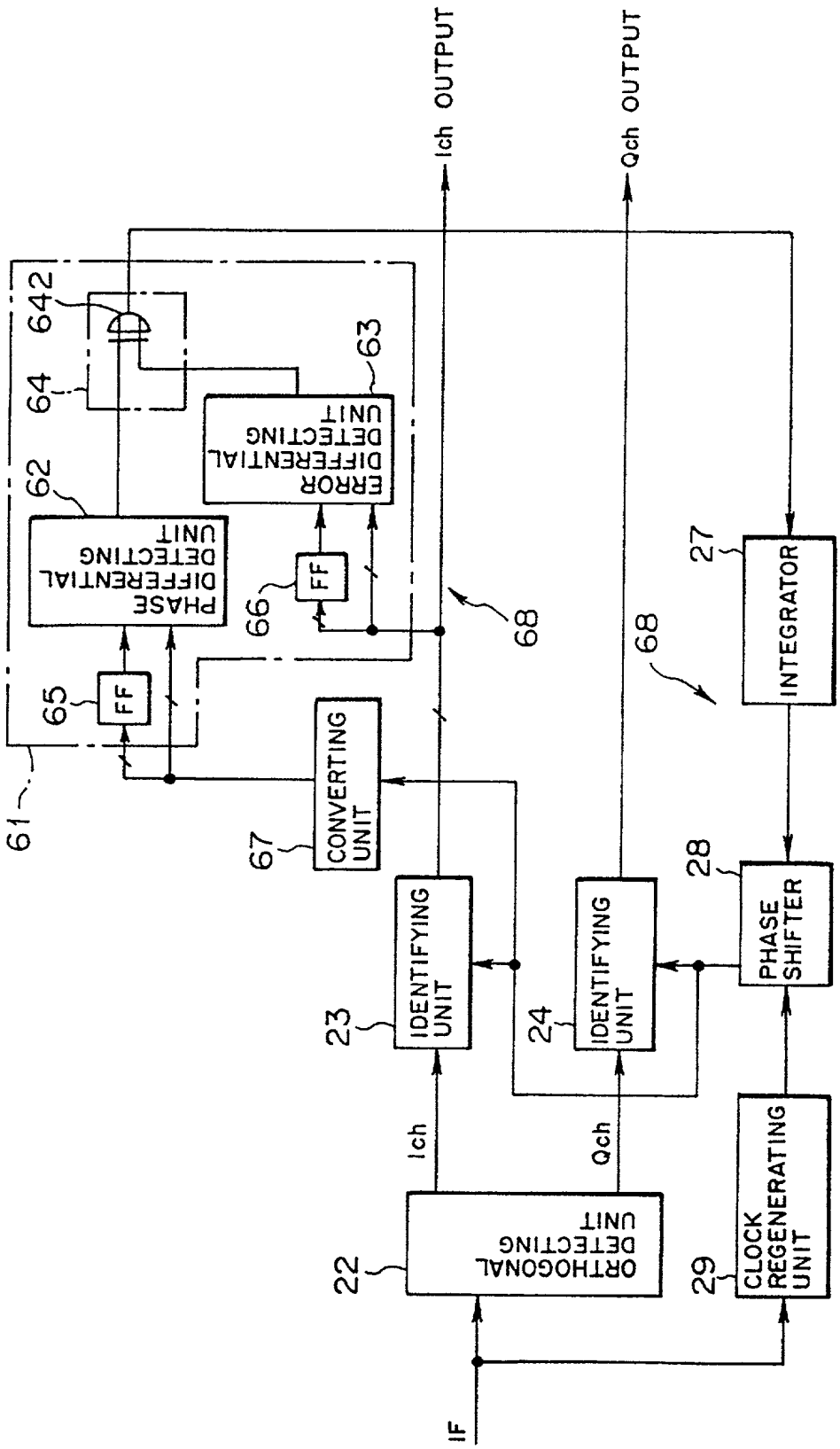

Ich OUTPUT
Qch OUTPUT
642
64
63
ERROR DIFFERENTIAL DETECTING UNIT
62
PHASE DIFFERENTIAL DETECTING UNIT
FF
66
68
65
FF
61
CONVERTING UNIT
67
27
INTEGRATOR
68
28
PHASE SHIFTER
IDENTIFYING UNIT
23
IDENTIFYING UNIT
24
Ich
Qch
ORTHOGONAL DETECTING UNIT
22
CLOCK REGENERATING UNIT
29
IF

FIG. 48

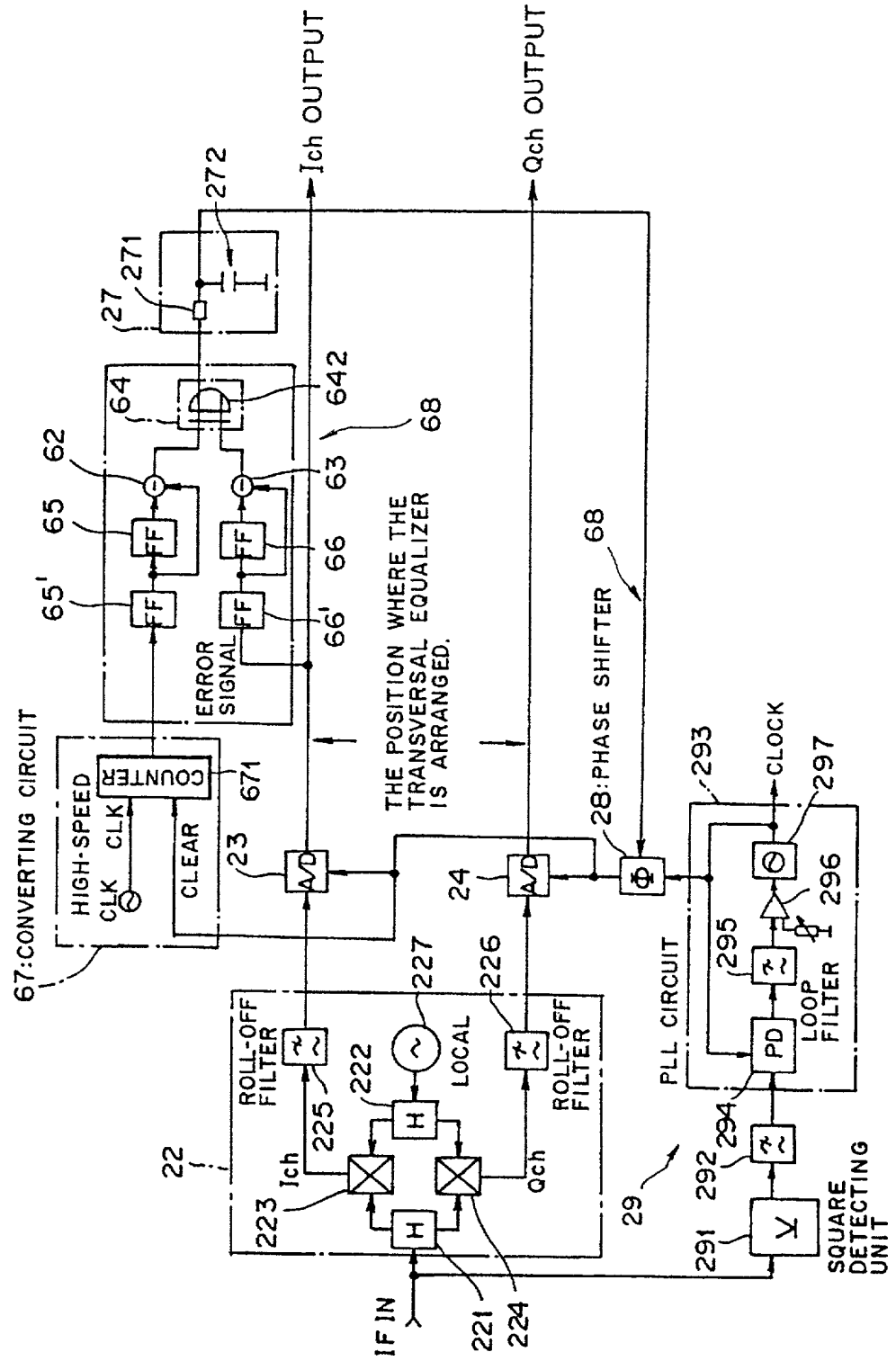

Ich OUTPUT
Qch OUTPUT
272
271
27
64
642
68
62
63
65
66
65'
66'
FF
ERROR SIGNAL
THE POSITION WHERE THE TRANSVERSAL EQUALIZER IS ARRANGED.
68
28:PHASE SHIFTER
67:CONVERTING CIRCUIT
HIGH-SPEED
CLK
CLK
COUNTER
671
CLEAR
23
24
A/D
293
CLOCK
297
296
295
PLL CIRCUIT
LOOP FILTER
PD
227
226
ROLL-OFF FILTER
222
LOCAL
225
Ich
Qch
223
22
29
294
292
291
SQUARE DETECTING UNIT
IF IN
221
224
H

FIG. 49

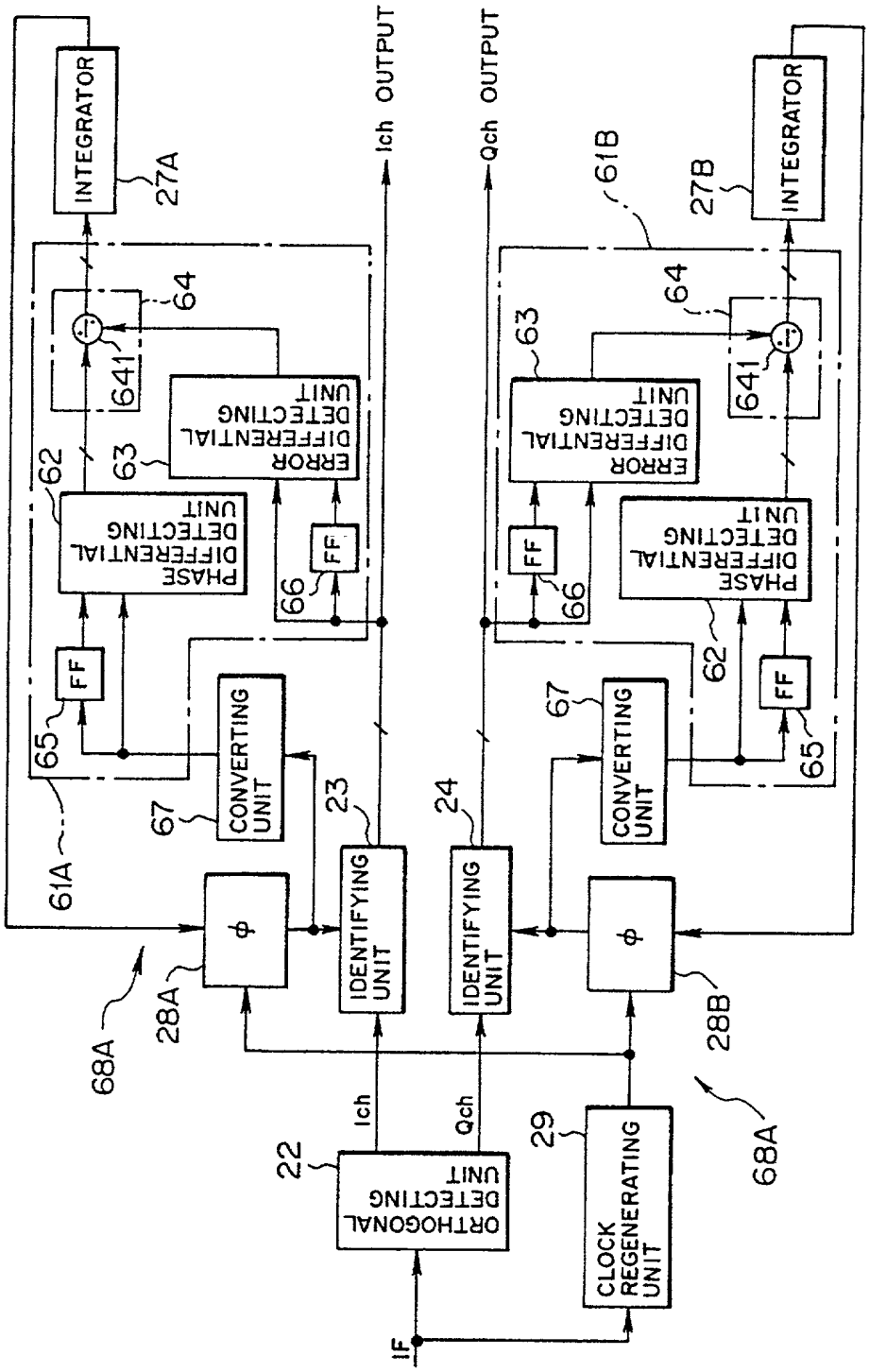

INTEGRATOR
27A
Ich OUTPUT
Qch OUTPUT
61B
27B
INTEGRATOR
64
641
63
ERROR DIFFERENTIAL DETECTING UNIT
62
PHASE DIFFERENTIAL DETECTING UNIT
FF
66
65
67
CONVERTING UNIT
61A
23
24
IDENTIFYING UNIT
φ
28A
28B
68A
Ich
Qch
22
ORTHOGONAL DETECTING UNIT
29
CLOCK REGENERATING UNIT
IF

FIG. 50

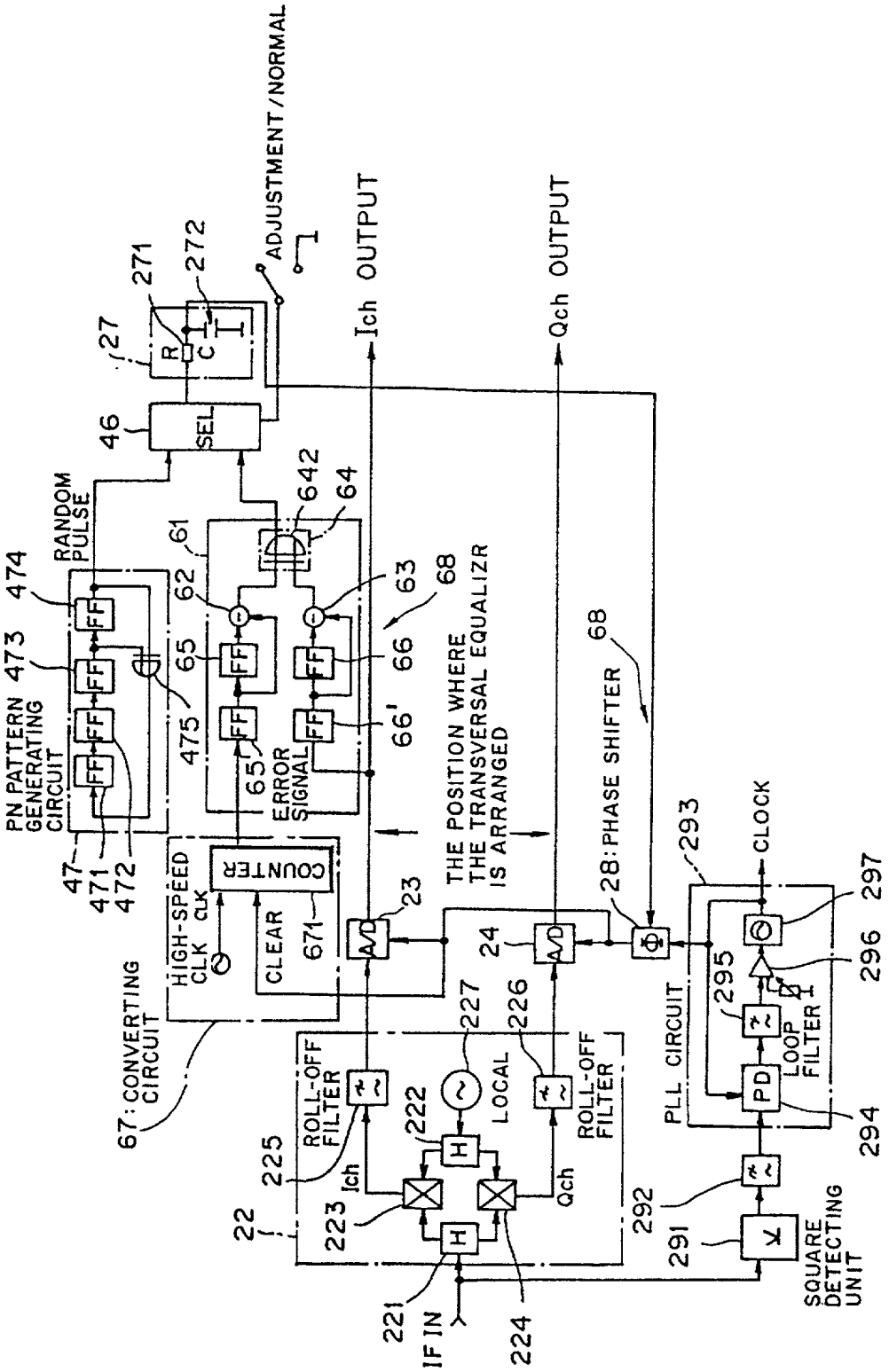

ADJUSTMENT/NORMAL
Ich OUTPUT
Qch OUTPUT
271
272
27
R
C
I
46
SEL
RANDOM PULSE
642
64
61
62
63
68
474
473
65
66
475
66'
PN PATTERN GENERATING CIRCUIT
ERROR SIGNAL
THE POSITION WHERE THE TRANSVERSAL EQUALIZR IS ARRANGED
68
28: PHASE SHIFTER
293
CLOCK
297
47
471
472
COUNTER
HIGH-SPEED CLK
CLEAR
671
A/D
23
24
296
295
67: CONVERTING CIRCUIT
227
226
ROLL-OFF FILTER
LOCAL
ROLL-OFF FILTER
PLL CIRCUIT
LOOP FILTER
PD
294
225
222
H
Ich
Qch
22
223
292
291
SQUARE DETECTING UNIT
221
IF IN
224

FIG. 51

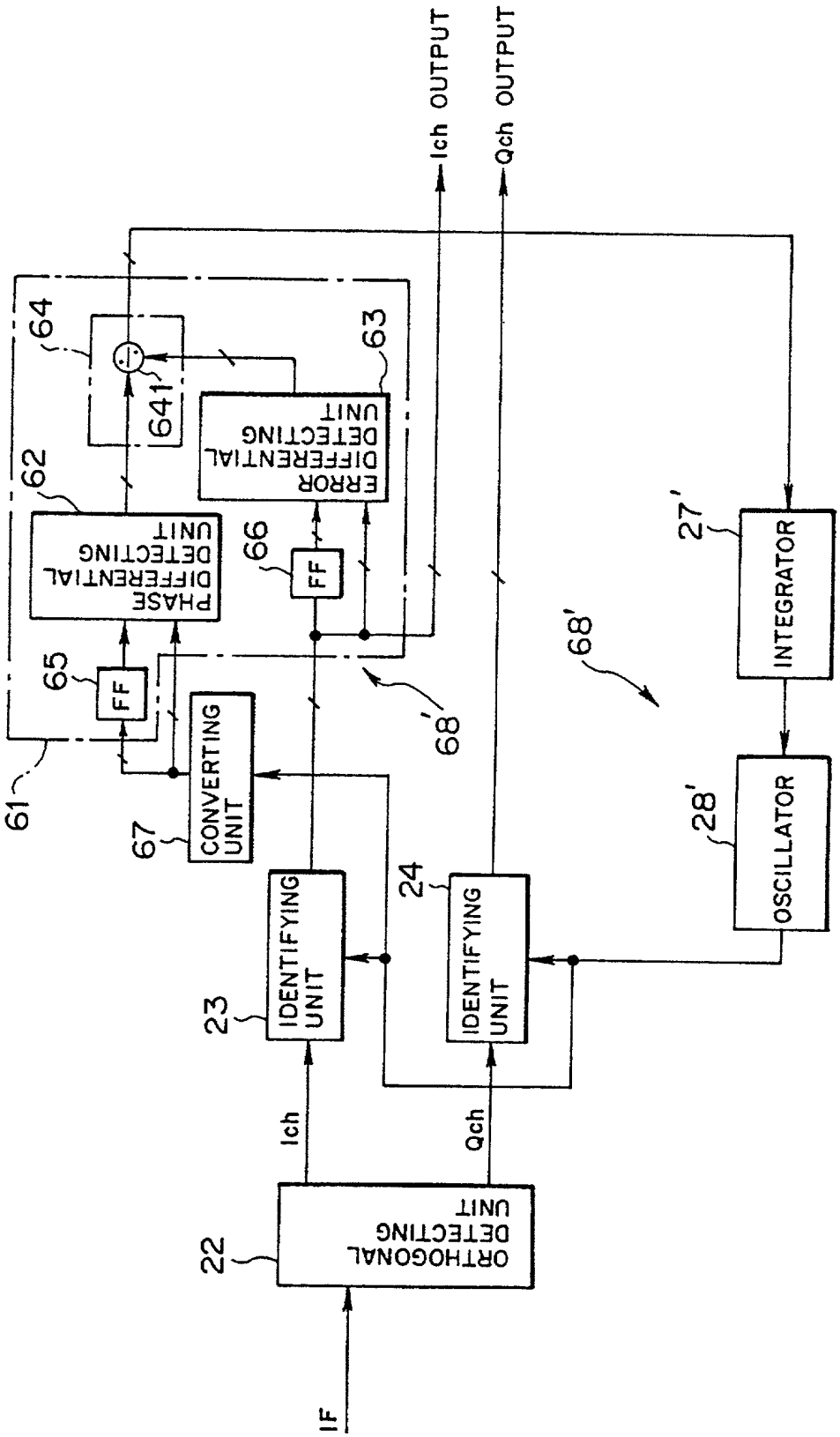

Ich OUTPUT
Qch OUTPUT
64
641
63
ERROR DIFFERENTIAL DETECTING UNIT
62
PHASE DIFFERENTIAL DETECTING UNIT
66
FF
65
FF
61
CONVERTING UNIT
67
68'
68'
27'
INTEGRATOR
28'
OSCILLATOR
24
IDENTIFYING UNIT
23
IDENTIFYING UNIT
Ich
Qch
22
ORTHOGONAL DETECTING UNIT
IF

FIG. 52

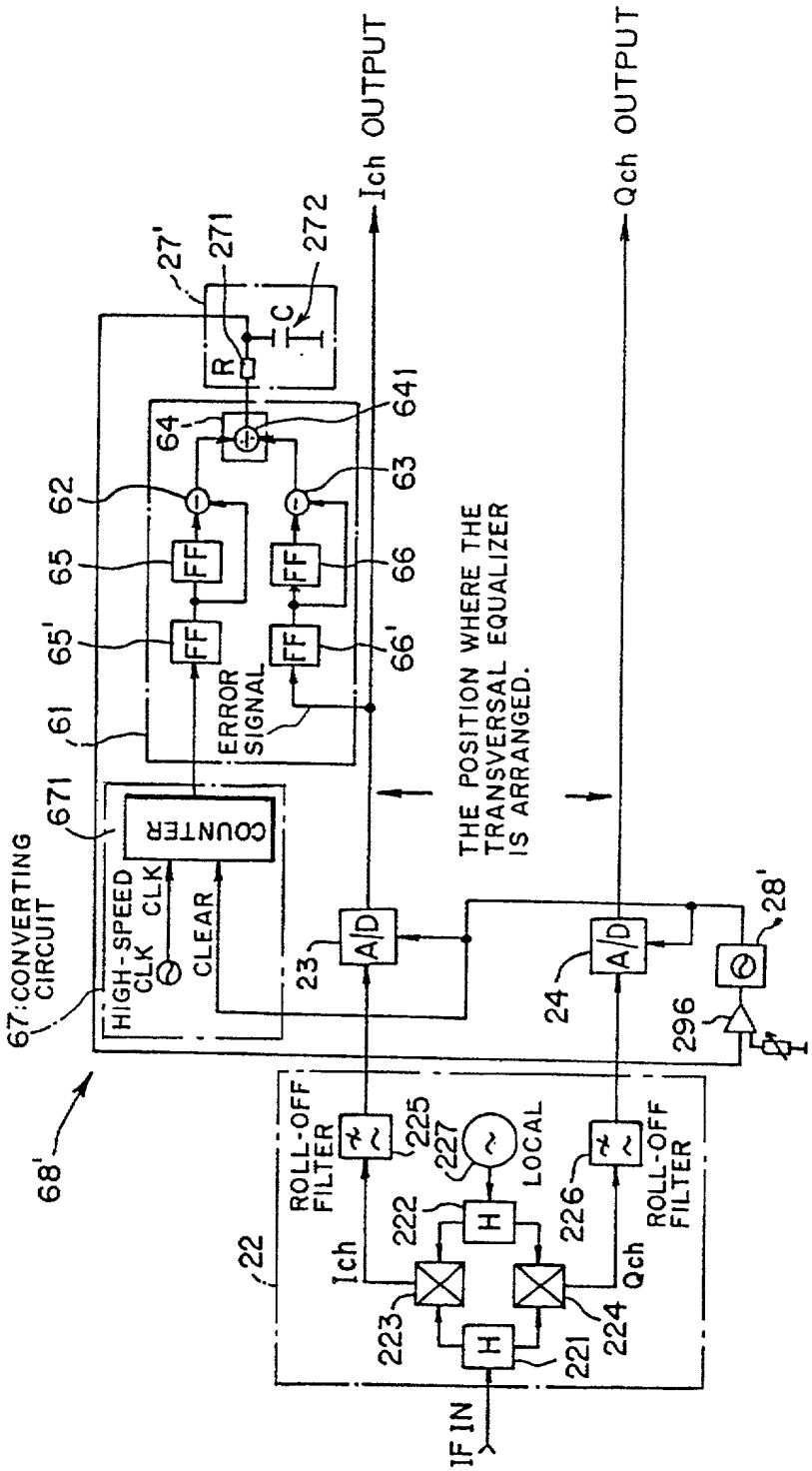

Ich OUTPUT
Qch OUTPUT
THE POSITION WHERE THE TRANSVERSAL EQUALIZER IS ARRANGED.
ERROR SIGNAL
COUNTER
HIGH-SPEED CLK
CLK
CLEAR
67:CONVERTING CIRCUIT
ROLL-OFF FILTER
LOCAL
Ich
Qch
IF IN
A/D
FF
R
C
I
H

FIG. 53

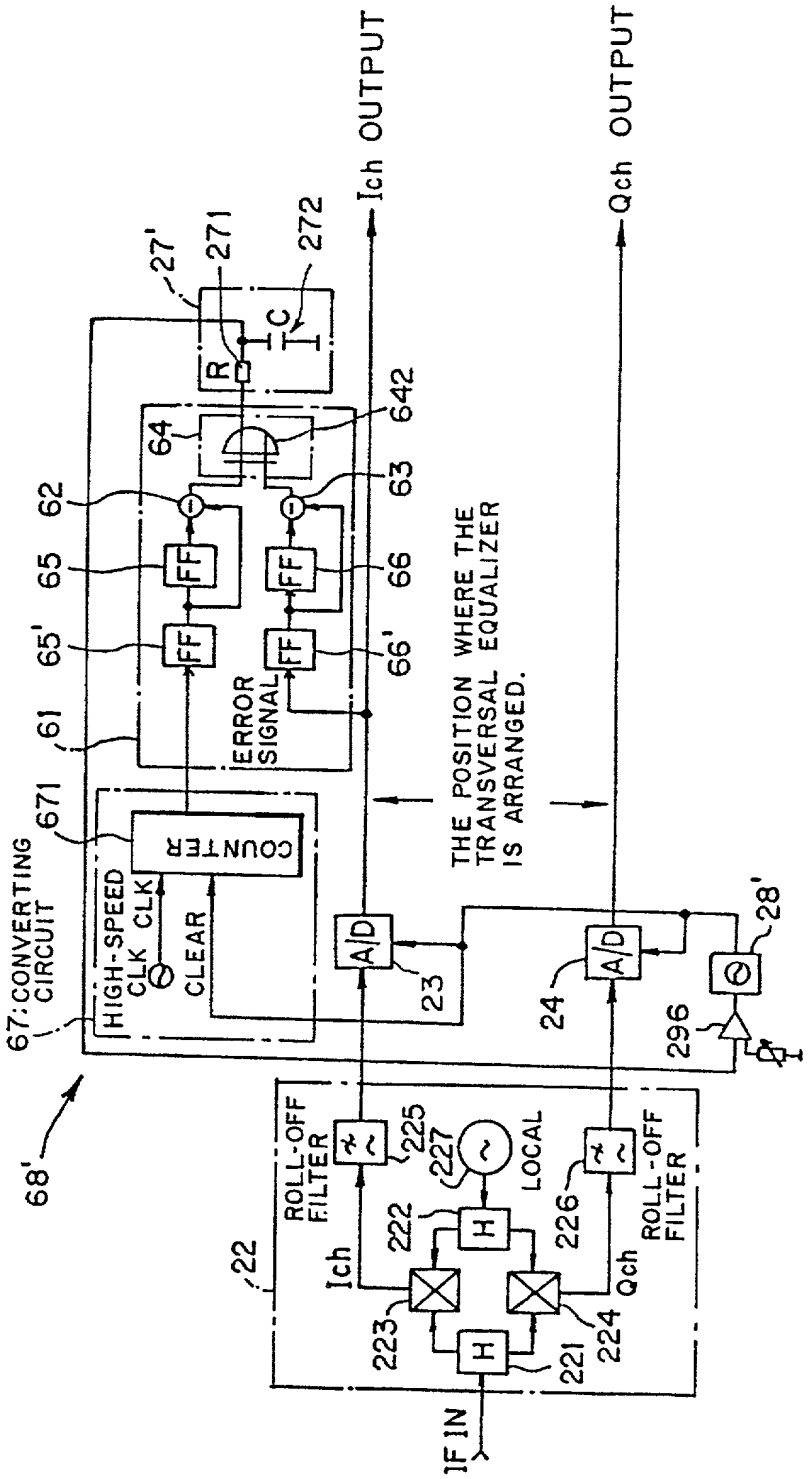

Ich OUTPUT
Qch OUTPUT
27'
271
272
R
Ic
64
642
63
62
65
66
65'
66'
FF
ERROR SIGNAL
61
671
COUNTER
HIGH-SPEED CLK
CLK
CLEAR
67: CONVERTING CIRCUIT
THE POSITION WHERE THE TRANSVERSAL EQUALIZER IS ARRANGED.
A/D
23
24
28'
296
68'
ROLL-OFF FILTER
225
227
LOCAL
222
226
H
Ich
Qch
223
224
221
22
IF IN

FIG. 54

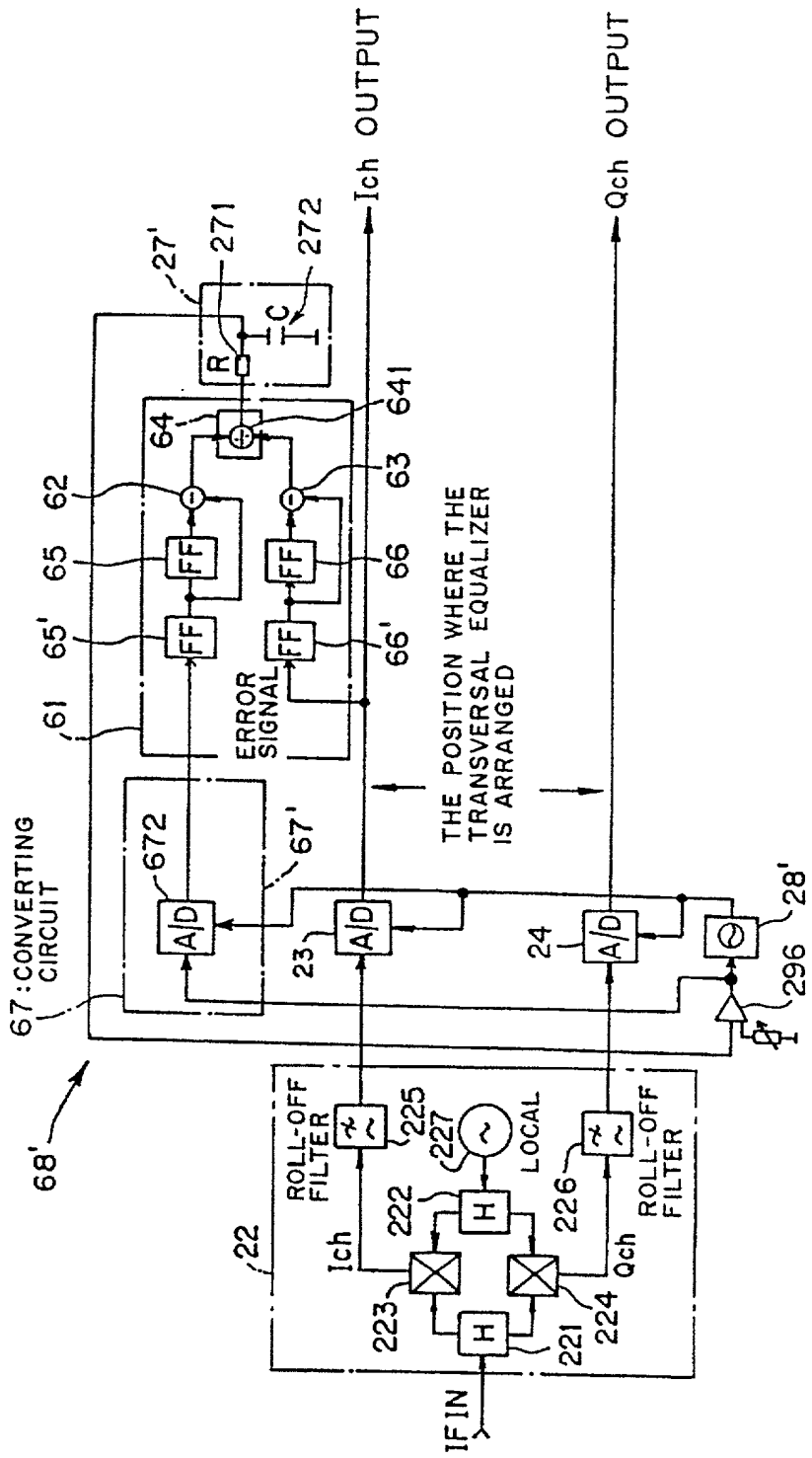

Ich OUTPUT
Qch OUTPUT
27'
271
272
R
I
C
64
641
62
63
65
66
65'
66'
FF
ERROR SIGNAL
61
THE POSITION WHERE THE TRANSVERSAL EQUALIZER IS ARRANGED
67:CONVERTING CIRCUIT
672
67'
A/D
23
24
28'
296
68'
ROLL-OFF FILTER
225
227
LOCAL
222
226
Ich
Qch
22
223
224
221
H
IFIN

FIG. 55

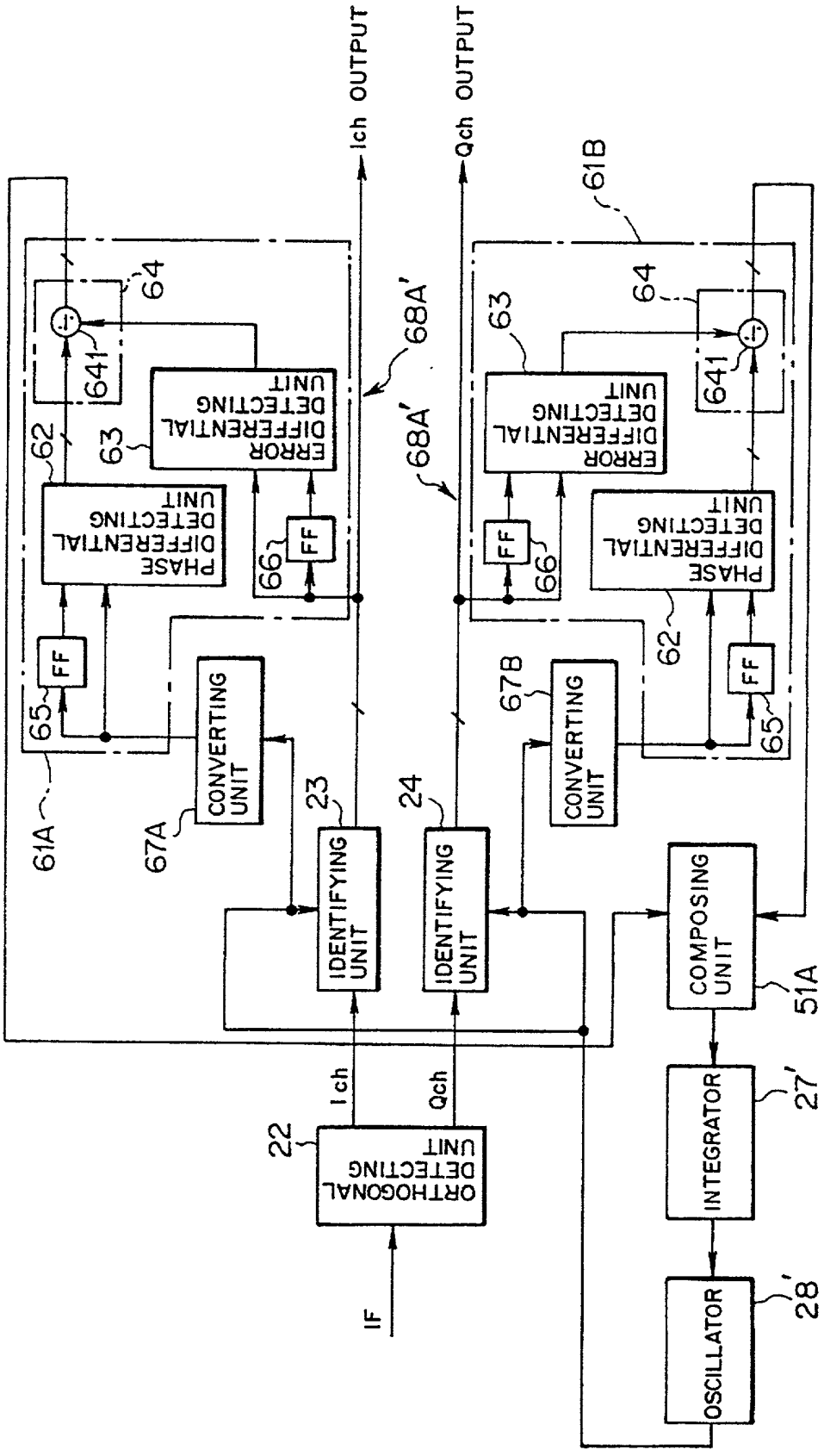

Ich OUTPUT
Qch OUTPUT
61B
64
641
63
ERROR DIFFERENTIAL DETECTING UNIT
68A'
62
PHASE DIFFERENTIAL DETECTING UNIT
66
FF
65
61A
67A
CONVERTING UNIT
67B
23
24
IDENTIFYING UNIT
COMPOSING UNIT
51A
I ch
Qch
22
ORTHOGONAL DETECTING UNIT
IF
INTEGRATOR
27'
OSCILLATOR
28'

FIG. 56

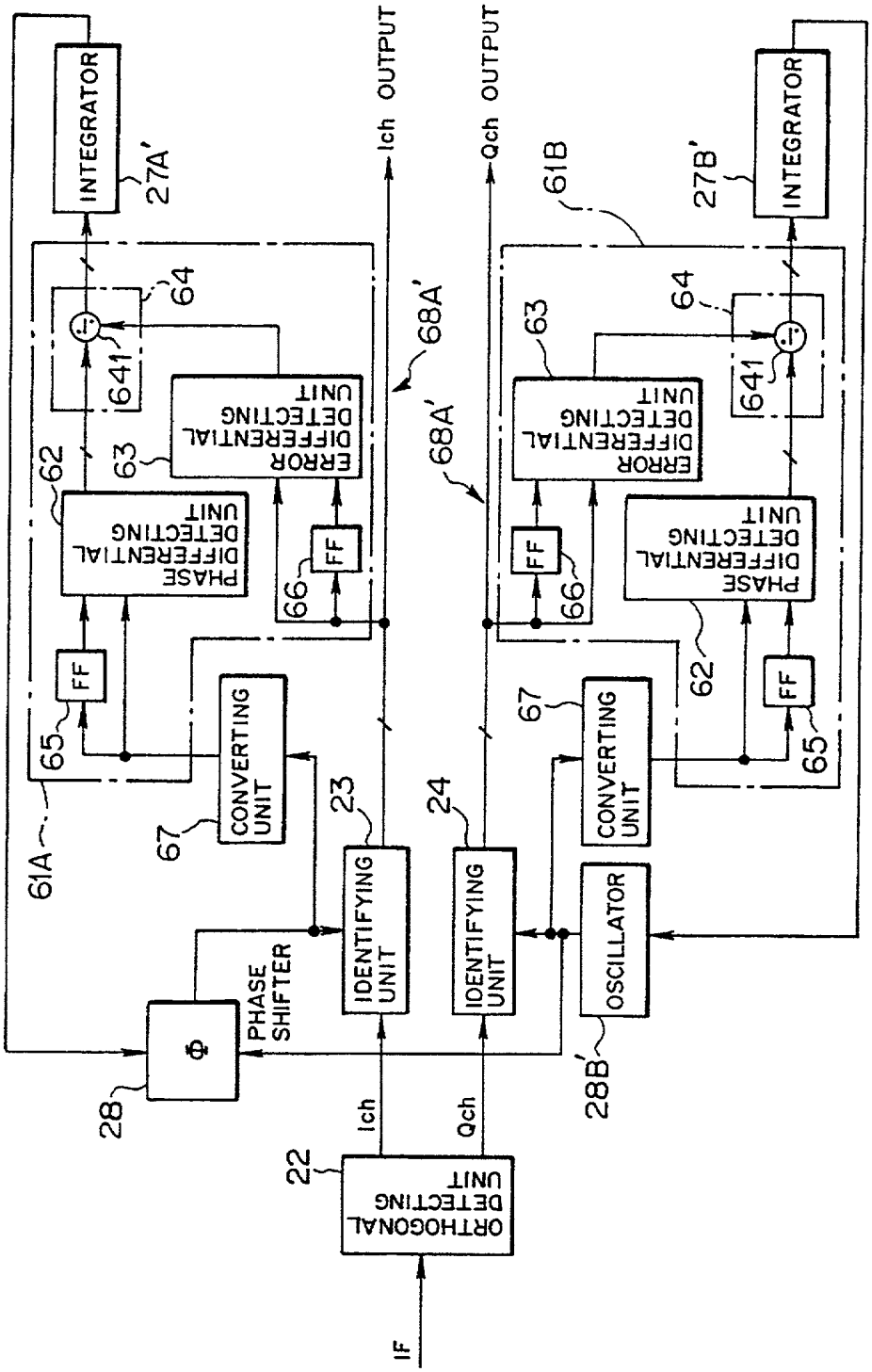

INTEGRATOR
27A'
Ich OUTPUT
Qch OUTPUT
61B
27B'
INTEGRATOR
64
641
63
ERROR DIFFERENTIAL DETECTING UNIT
68A'
68A'
62
PHASE DIFFERENTIAL DETECTING UNIT
FF
66
65
61A
CONVERTING UNIT
67
23
24
IDENTIFYING UNIT
IDENTIFYING UNIT
PHASE SHIFTER
OSCILLATOR
28
28B'
Ich
Qch
22
ORTHOGONAL DETECTING UNIT
IF

FIG.57

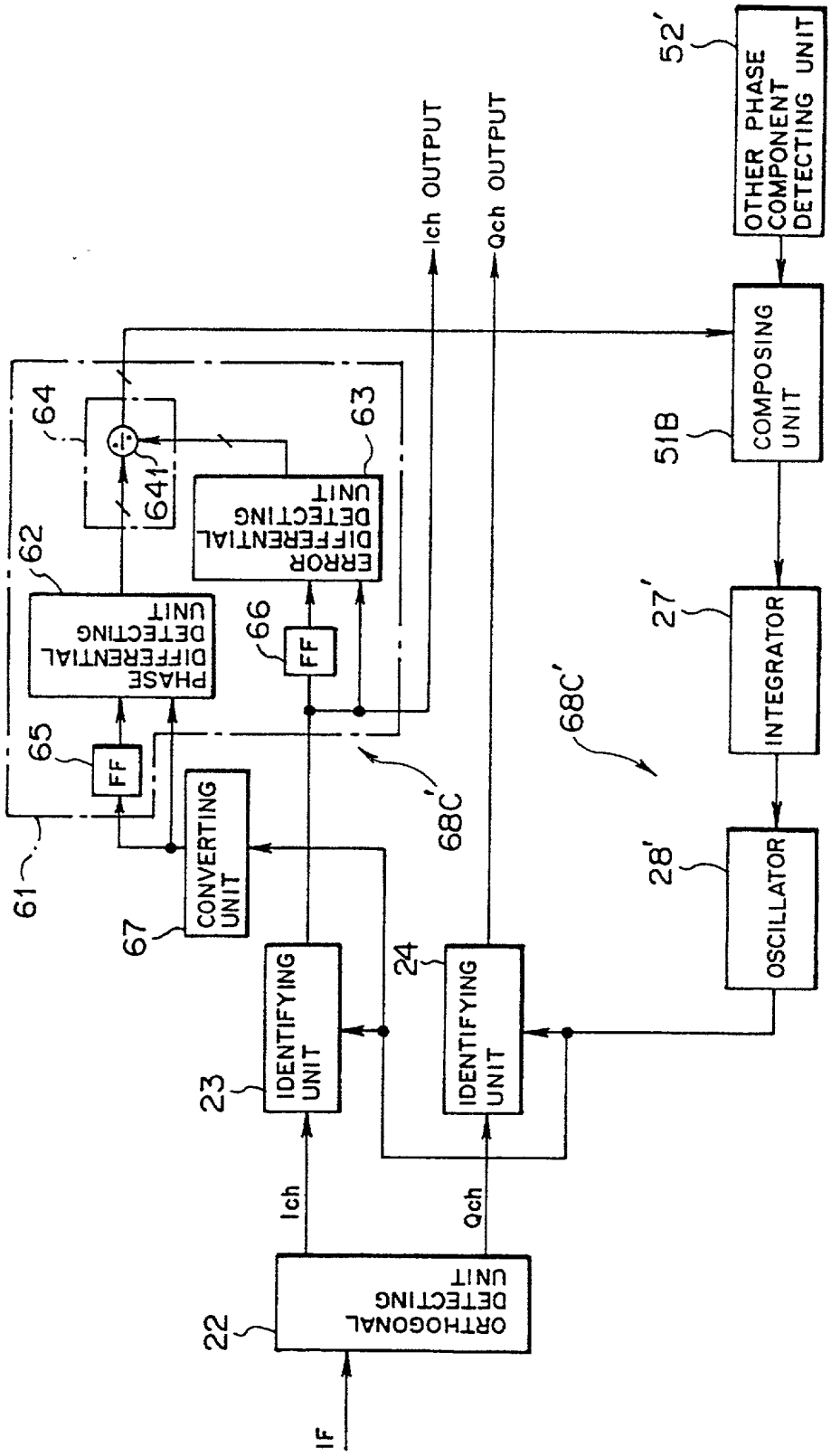

IF
ORTHOGONAL DETECTING UNIT
22
Ich
Qch
IDENTIFYING UNIT
23
IDENTIFYING UNIT
24
CONVERTING UNIT
67
61
68C'
68C'
FF
65
PHASE DIFFERENTIAL DETECTING UNIT
62
641
64
ERROR DIFFERENTIAL DETECTING UNIT
63
FF
66
Ich OUTPUT
Qch OUTPUT
COMPOSING UNIT
51B
OTHER PHASE COMPONENT DETECTING UNIT
52'
INTEGRATOR
27'
OSCILLATOR
28'

FIG.58

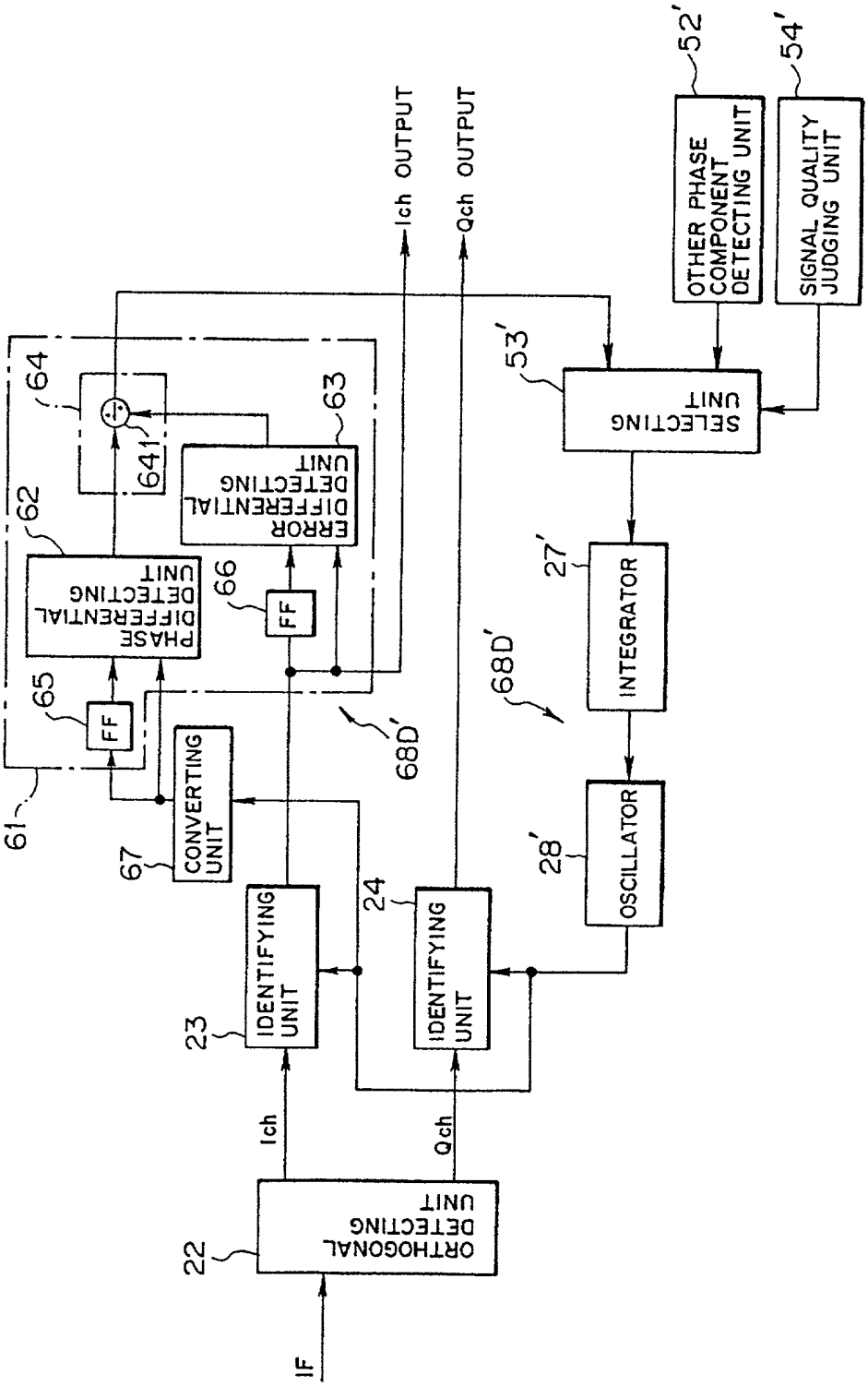

IF
ORTHOGONAL DETECTING UNIT
22
Ich
Qch
IDENTIFYING UNIT
23
IDENTIFYING UNIT
24
CONVERTING UNIT
67
61
FF
65
PHASE DIFFERENTIAL DETECTING UNIT
62
FF
66
ERROR DIFFERENTIAL DETECTING UNIT
63
641
64
68D'
68D'
OSCILLATOR
28'
INTEGRATOR
27'
SELECTING UNIT
53'
OTHER PHASE COMPONENT DETECTING UNIT
52'
SIGNAL QUALITY JUDGING UNIT
54'
Ich OUTPUT
Qch OUTPUT

FIG. 59

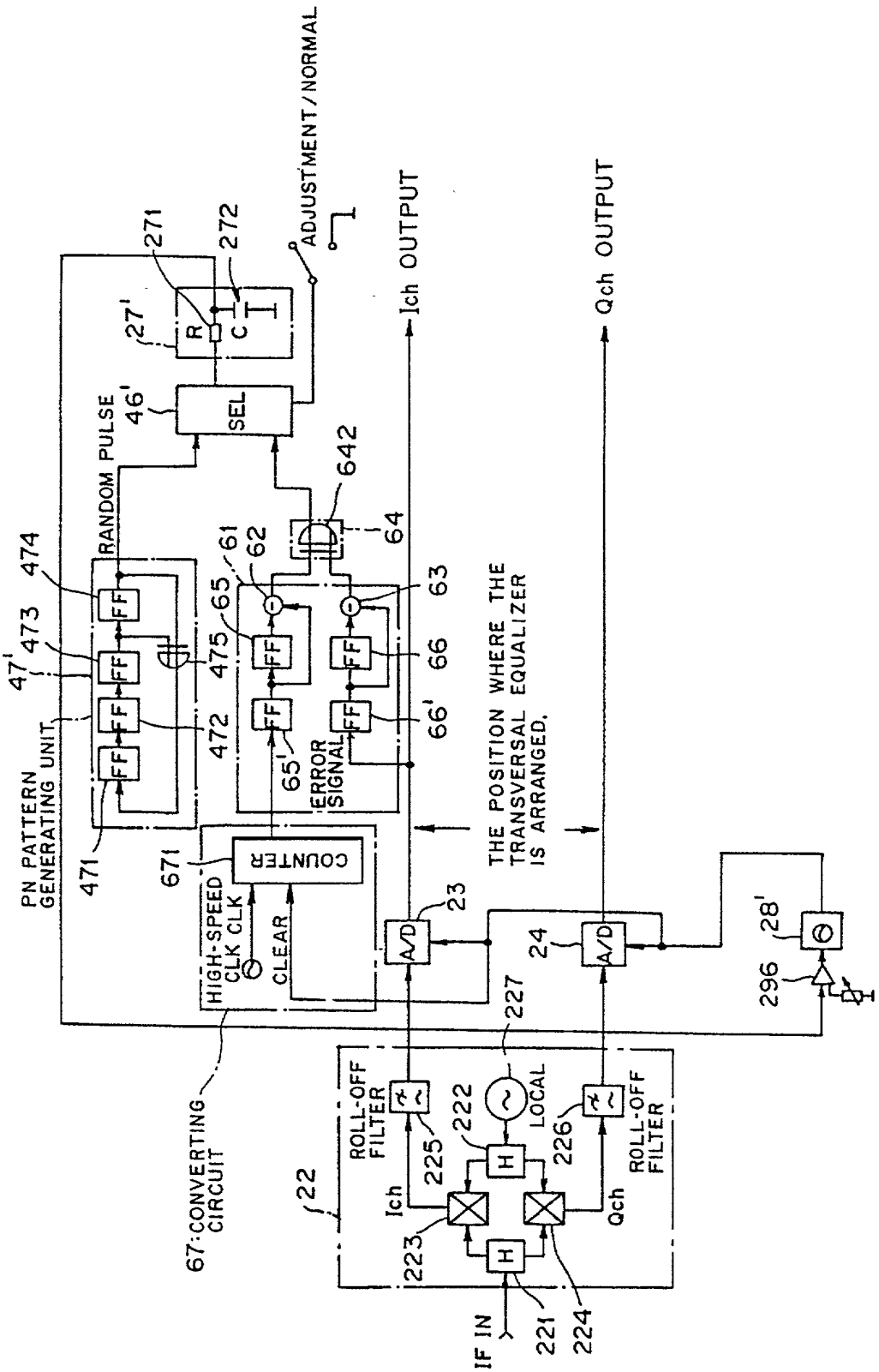
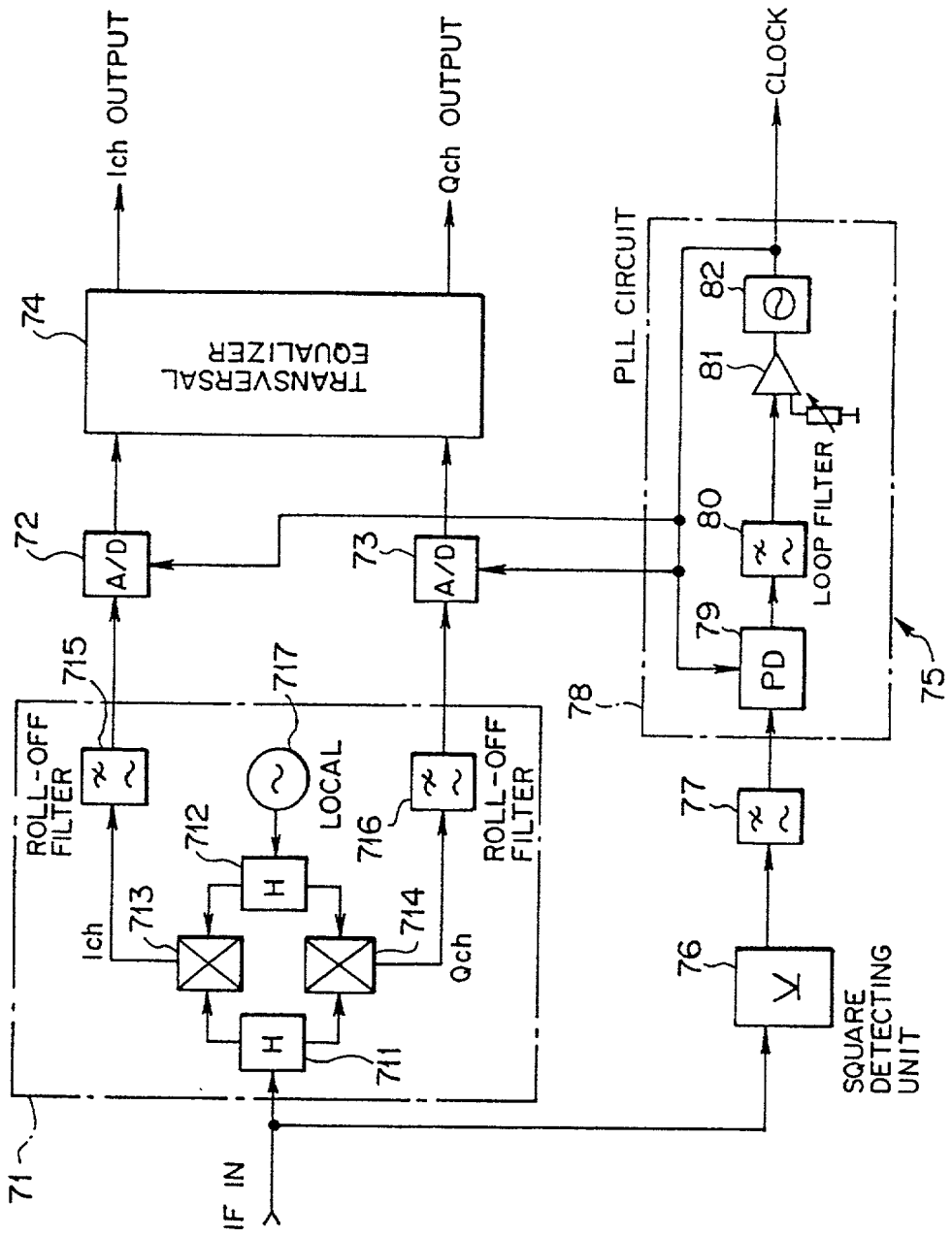

ADJUSTMENT/NORMAL
271
272
27'
R
C
SEL
46'
RANDOM PULSE
642
64
61
62
63
65
66
66'
65'
474
473
47'
475
472
471
PN PATTERN GENERATING UNIT
FF
ERROR SIGNAL
THE POSITION WHERE THE TRANSVERSAL EQUALIZER IS ARRANGED.
671
COUNTER
HIGH-SPEED CLK CLK
CLEAR
Ich OUTPUT
Qch OUTPUT
A/D
23
24
28'
296
227
67:CONVERTING CIRCUIT
22
ROLL-OFF FILTER
225
222
LOCAL
226
Ich
Qch
223
221
224
IF IN
H

FIG. 60
PRIOR ART



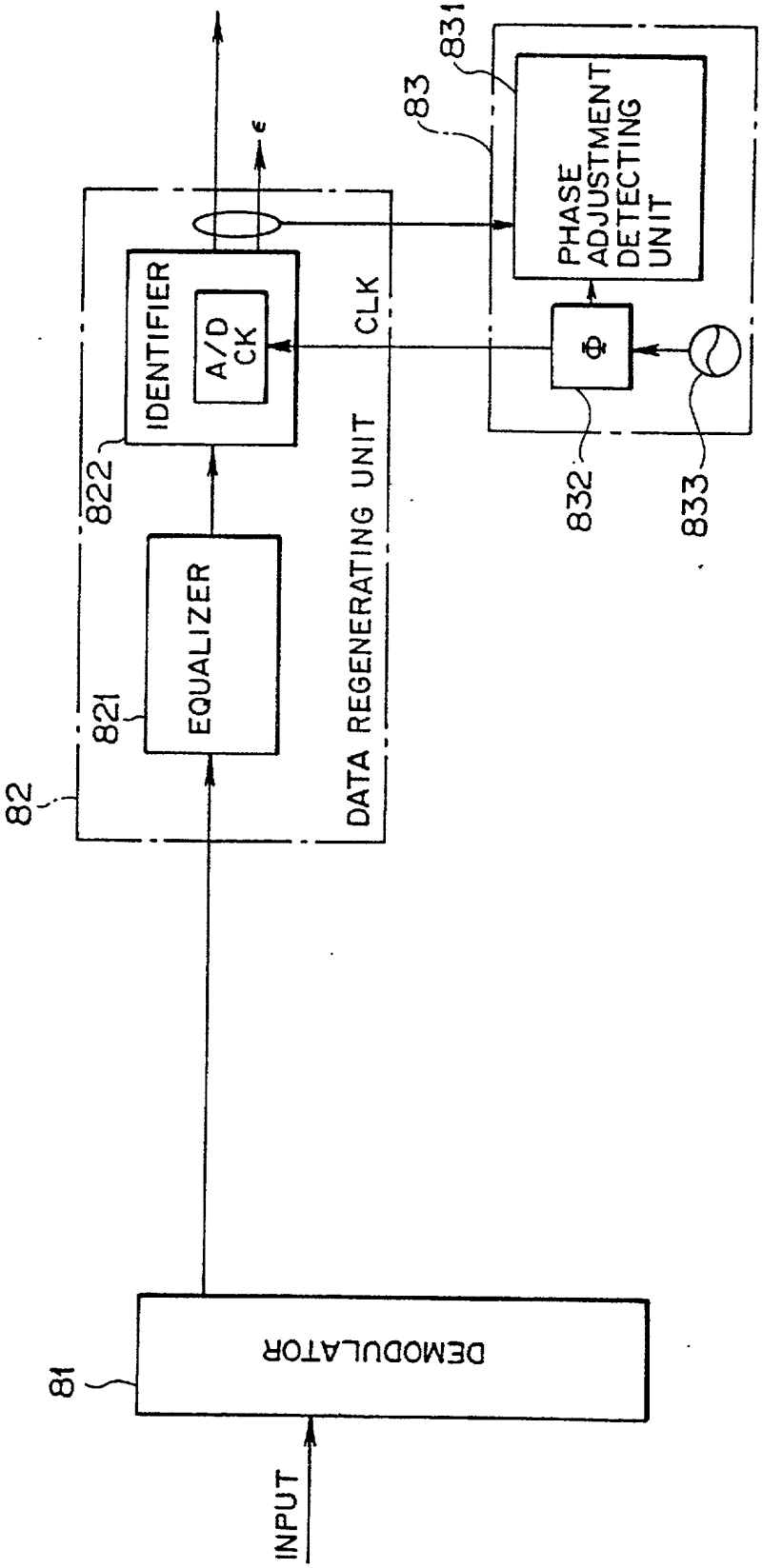


FIG. 61
PRIOR ART